NOAA PROFILER NETWORK

TECHNICAL REVIEW

June 22, 2004

NOAA PROFILER NETWORK

TECHNICAL REVIEW

Introduction and Highlights

Presented by

Margot H. Ackley

June 22, 2004

NOAA Profiler Network

Technical Review

June 22, 2004

AGENDA

• Introduction and Highlights	Margot Ackley
• NPN COEA	Tom Schlatter[1]
• Network Status	Doug van de Kamp

BREAK

• Hardware, Software, and Communications	Alan Pihlak
• Field Activities and Engineering	Michael Shanahan
• NPN's Future in NWS	David Helms[2]
• Concluding Remarks and Q & A	Margot Ackley

[1]Guest Speaker: Office of the Director, Forecast Systems Laboratory, OAR
[2]Guest Speaker: Science Plans Branch, Office of Science and Technology, NWS

FORECAST SYSTEMS LABORATORY

Demonstration Division
NOAA Profiler Network
&
GPS-MET Network

Margot Ackley, Chief

Debby Bowden, Administrative Asst.

Software Development & Web Services

Alan Pihlak Chief

- Leon Benjamin
- Mike Foy
- Rob Prentice
- Scott Stierle

Facilities Management & Systems Adm.

Jean Tomkowicz Chief

- Jim Bussard
- Mike Pando

Network Operations

Doug van de Kamp Chief

- Norm Abshire
- Mike Bowden
- Jim Budler
- Daphne Grant

Engineering & Field Support

Mike Shanahan Chief

- Norm Abshire
- Mac Carrithers
- Dave Glaze
- Brian Koonsvitsky
- Brian Phillips
- Richard Strauch
- David Wheeler

GPS-MET Systems

Seth Gutman Chief

- Kirk Holub
- Susan Sahm

BLEAK

FY – 04

NPN Budget was de-funded

$0.M instead of $4.15M

Bleak

- **Very late in the FY04 budget formulation process, Office of Management and Budget removed NPN funding from the President's budget released to the Nation February 2003.**
- **NPN staff advised of situation on Friday the 13th December 2002.**
- **Only Congress could restore our funding.**

Bright

- Congress restored FY04 funding through NWS instead of OAR.
- Congress directed the NWS to undertake a “Cost and Operational Effectiveness Analysis” of the NPN.
- New funding path promotes technology transfer from research (OAR) to operations (NWS).

March 31, 2003

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

New Priorities for the 21st Century

NOAA's Strategic Plan for FY 2003 - FY 2008 and Beyond

Mission Goal 3. SERVE SOCIETY'S NEEDS FOR WEATHER AND WATER INFORMATION

On average, hurricanes, tornadoes, tsunamis, and other severe weather events cause $11 billion in damages per year. Weather, including space weather, is directly linked to public safety and about one-third of the U.S. economy (about $3 trillion) is weather sensitive. With so much at stake, NOAA's role in observing, forecasting, and warning of environmental events is expanding, while economic sectors and its public are becoming increasingly sophisticated at using NOAA's weather, air quality, and water information to improve their operational efficiencies and their management of environmental resources, and quality of life.

NOAA is strategically positioned to conduct sound science and provide integrated observations, predictions, and advice for decision makers to manage many aspects of environmental resources–from fresh water to coastal ecosystems and air quality. Bridging weather and climate time scales, NOAA will continue to collect environmental data and issue forecasts and warnings that help protect life and property and enhance the U.S. economy.

NOAA is committed to excellent customer service. We depend on our partners in the private sector,

STRATEGIES AND MEASURES OF SUCCESS

Monitor and Observe: NOAA will use cost-effective observation systems that meet diverse and expanding societal needs for accuracy, parameters observed, and temporal and geographic coverage.

- Increased observations obtained and used from partners, both international and domestic.
- Increased observations archived, available, and accessible.
- Increased number of new multi-use observing systems deployed.
- Improved effectiveness of NOAA's observing systems.

Understand and Describe: NOAA will invest in new technologies, techniques, and weather and water forecast modeling.

- Increased number of modeling advances by government and academia demonstrated to improve the NOAA operational prediction suite.
- Shortened cycle times from research (government and academic) to operations (e.g., models, technology, and techniques) through the use of testbeds and other methods.
- Improved accuracy of weather and air quality prediction models.
- Increased number of new research findings and progress toward their implementation in NOAA operations.

Assess and Predict: NOAA will improve forecast and warning capabilities to reduce uncertainty and increase economic benefits.

- Increased use of observation data for verification of and assimilated into weather, ocean, water, and climate prediction models.
- Increased number of forecasters trained in the newest techniques.
- Increased volume of forecast and warning information formatted to clarify the uncertainty of an event (e.g., space weather, air quality, water and weather forecasts.
- Improved performance of NOAA's weather and water, air quality, and space weather prediction suite.


Forecast Systems Laboratory
Observing Systems
Modeling, Assimilation, & Computing
Operational Forecast
Satellite
Radar
Balloon
Surface
Aircraft
AIR CANADA
Assimilate
RUC/MAPS Forecast for Apr 24 5:00 MDT
Model
Human Interaction and Value-Added
Visualization
Public
Transferring science and technology to operational weather services

NOAA Profiler Network

- **Began in 1986 with a Congressional Initiative for $6 million/year.**
- **Achieved full operational capability on May 18, 1992 with deployment of Blue River, Wisconsin profiler.**

NOAA Profiler Network

Original Mission Statement

- To Develop, Deploy and Operate a Network of 30 Wind Profilers in the Central United States.
- In Cooperation with NWS and Other Agencies, Conduct an Assessment of that Network.

Assessment Report, endorsed by Directors of OAR and NWS, published August 1994.

NOAA Profiler Network

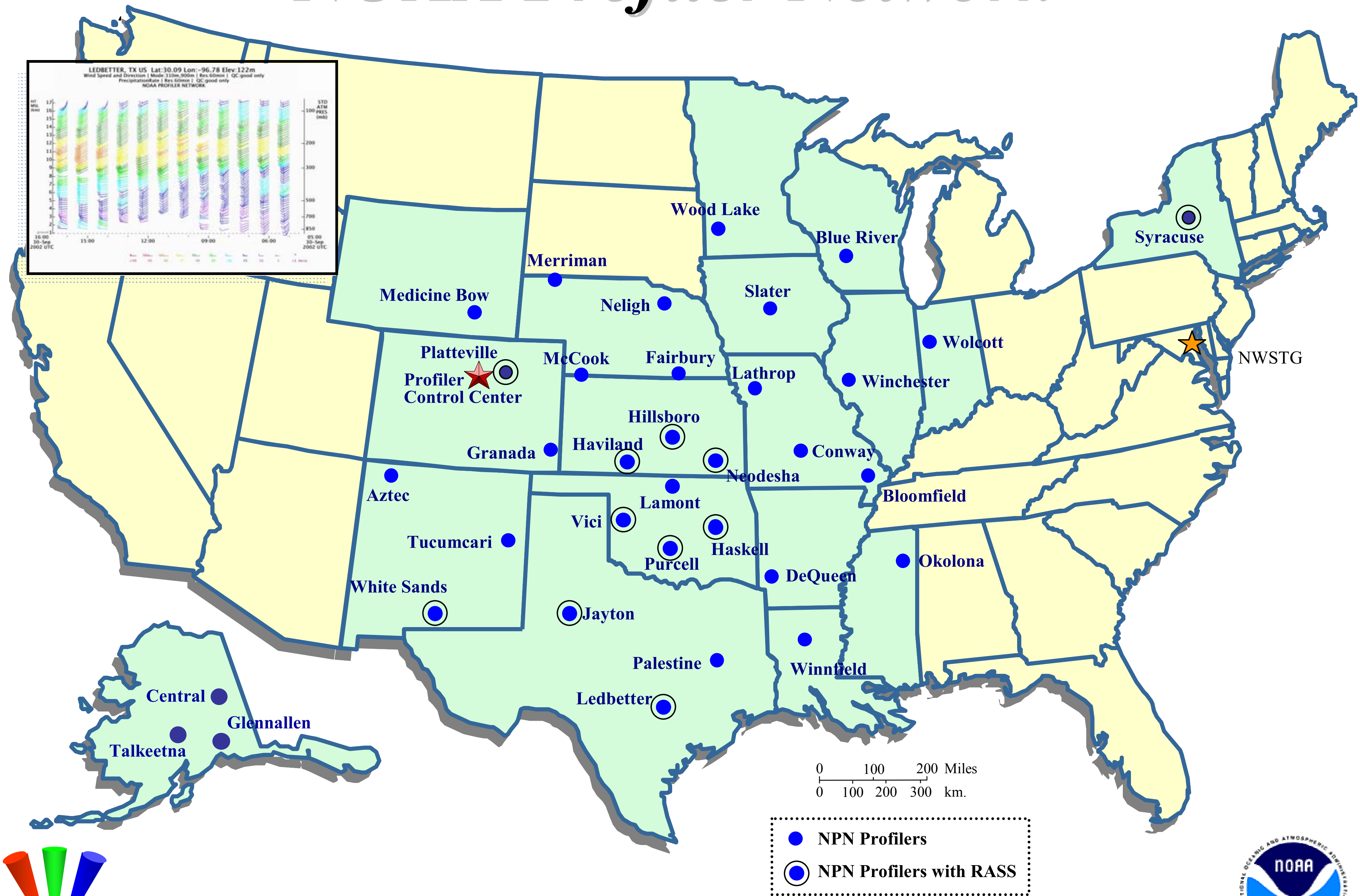
Collaboration between OAR and NWS

OAR/NWS Basic Agreement

- ***National Data Buoy Center:*** Engineering, contract management, and surface met sensor support
- ***Central and Southern Regions:*** Profiler field maintenance by Electronics Technicians
- ***Office of Operational Systems:*** Logistics and configuration management support, depot-level maintenance (NRC) and warehousing of spare parts (NLSC)

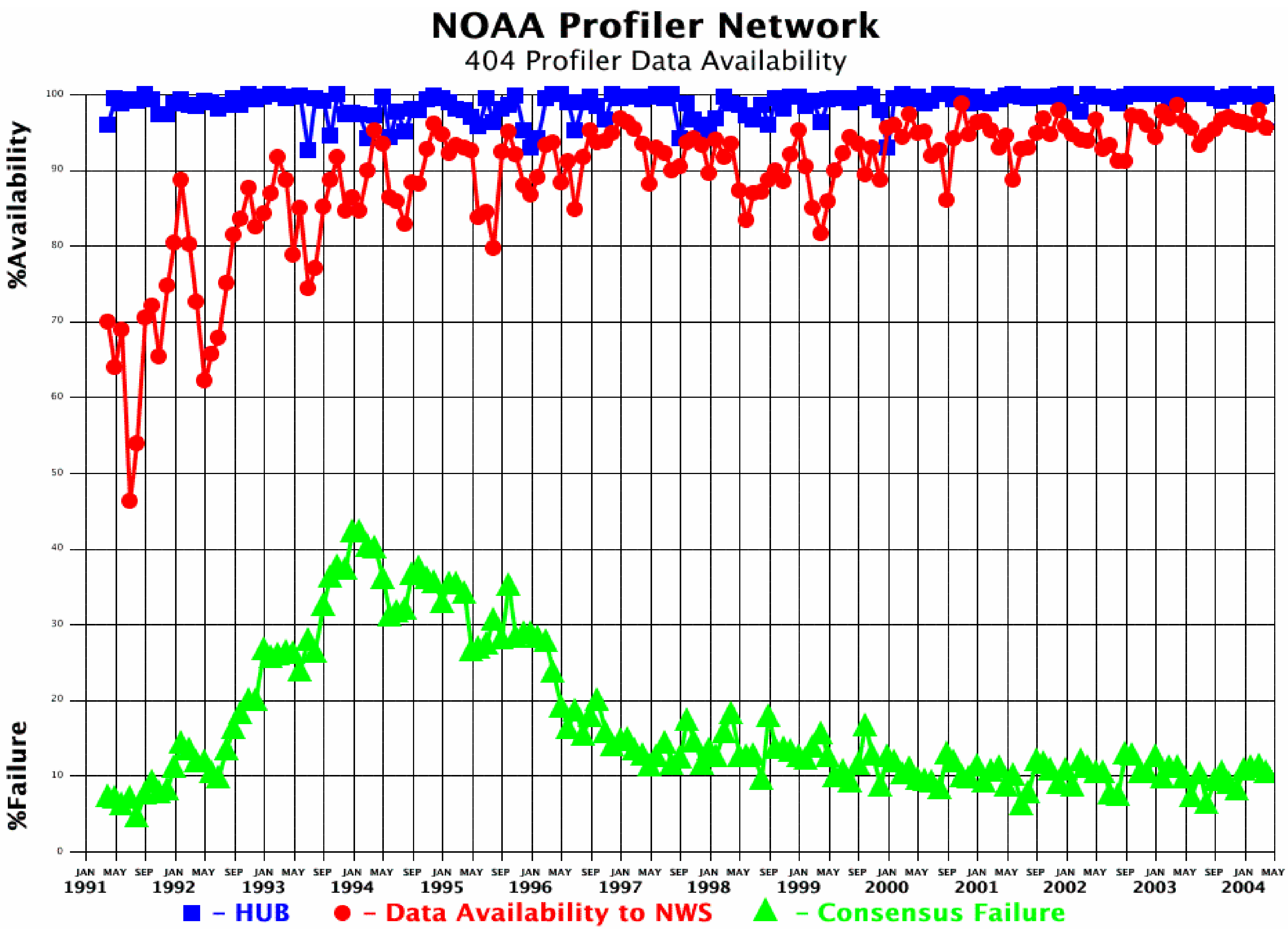
Annual Training for NWS Technicians

NOAA Profiler Network



Profiler Program Office
325 Broadway, Boulder, Colorado 80305-3328 (303) 497-6200

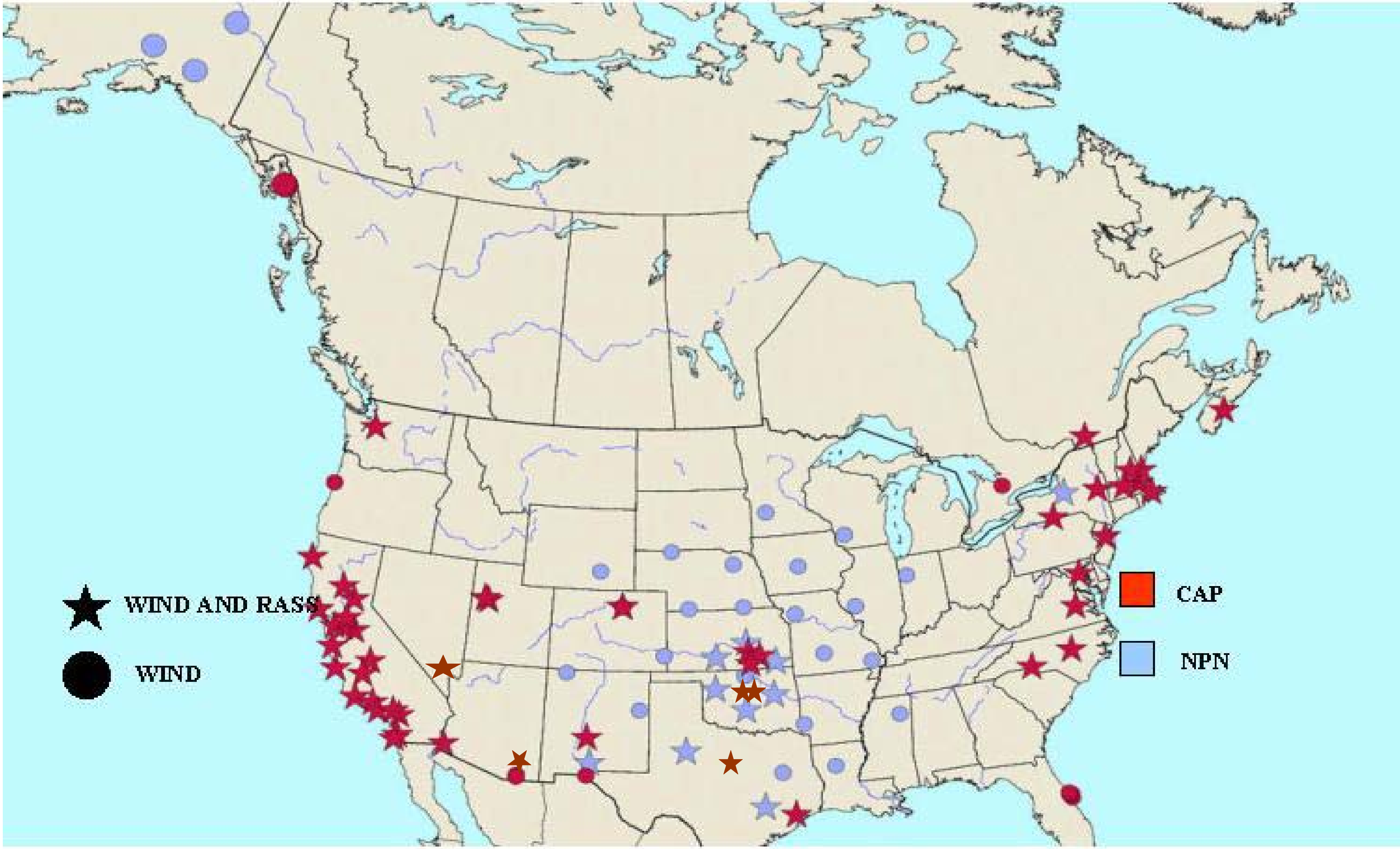
National Oceanic and Atmospheric Administration


NOAA Profiler Network
404 Profiler Data Availability
%Availability
%Failure
100
90
80
70
60
50
40
30
20
10
0
JAN MAY SEP
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
■ – HUB
● – Data Availability to NWS
▲ – Consensus Failure

Highlights

- Began integration of 100+ Cooperative Agency Profilers (CAP) into NPN monitoring activities. Experience gained will be valuable for national profiler network.

Cooperative Agency Profilers (CAP) with NPN Systems



June 2004

Cooperative Agency Profilers

Rutgers, NJ Profiler

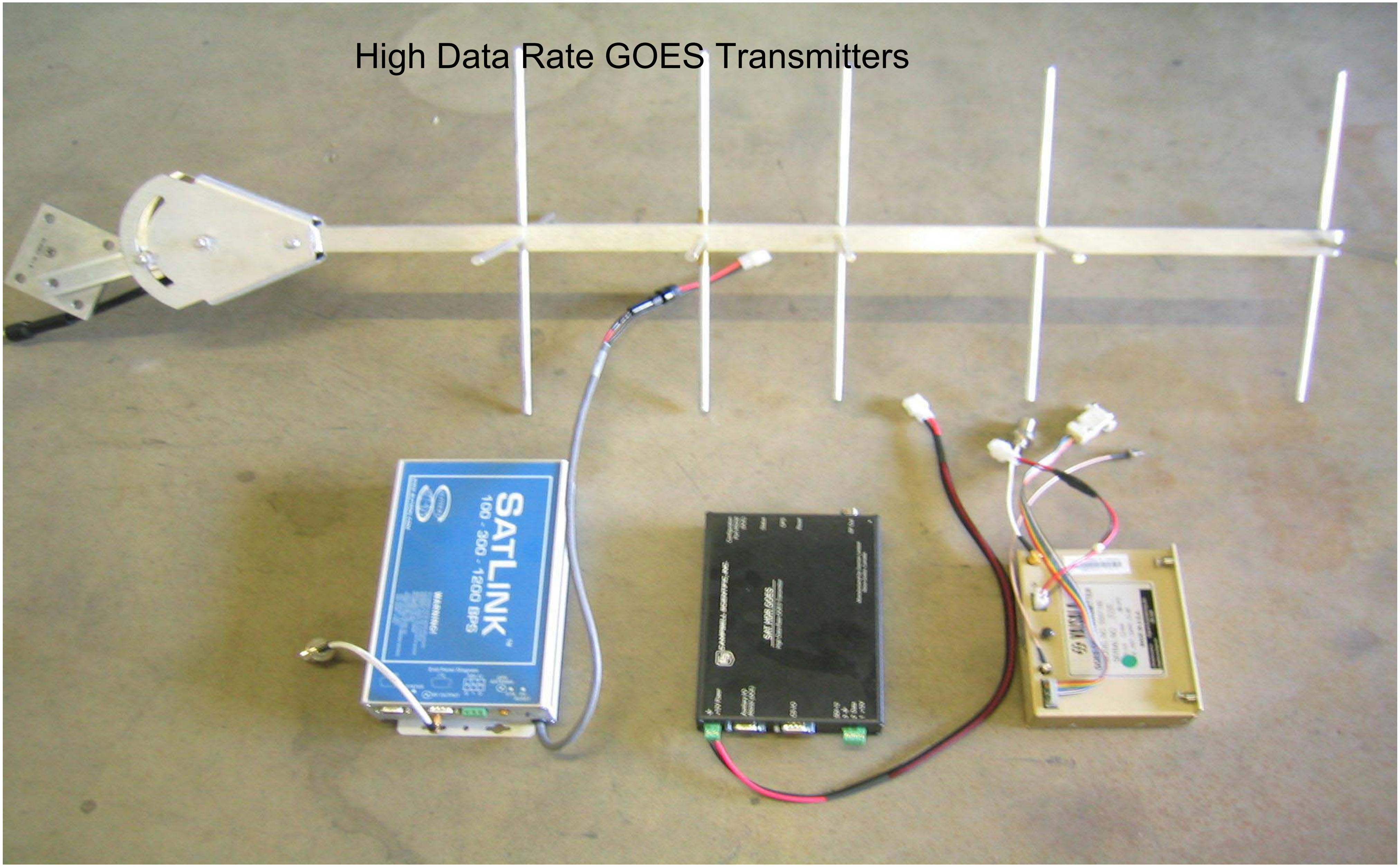
915 MHz profiler with RASS

Courtesy of Rutgers University

TARS Ft. Huachuca, AZ. Quarter-scale 449 MHz Profiler

Highlights

- Began integration of 100+ Cooperative Agency Profilers (CAP) into NPN monitoring activities. Experience gained will be valuable for national profiler network.
- Investigated alternative technologies to reduce data communication costs.
  - GOES High Data Rate (1200 baud)
  - Satellite Internet



High Data Rate GOES Transmitters models shown above clockwise from lower right are the Vaisala HDR GOES-1200, Campbell Scientific SAT HDR GOES, & Sutron Satlink HDR GOES

Wood Lake, MN

July 29, 2003

Highlights

- Began integration of 100+ Cooperative Agency Profilers (CAP) into NPN monitoring activities. Experience gained will be valuable for national profiler network.
- Investigated alternative technologies to reduce data communication costs.
  - GOES High Data Rate (1200 baud)
  - Satellite Internet
- **Restored funding and began planning for future with NWS.**

BRIGHT

FY – 04

$4+ M Received

PPBES process started for

NOAA Goal 3: Weather and Water

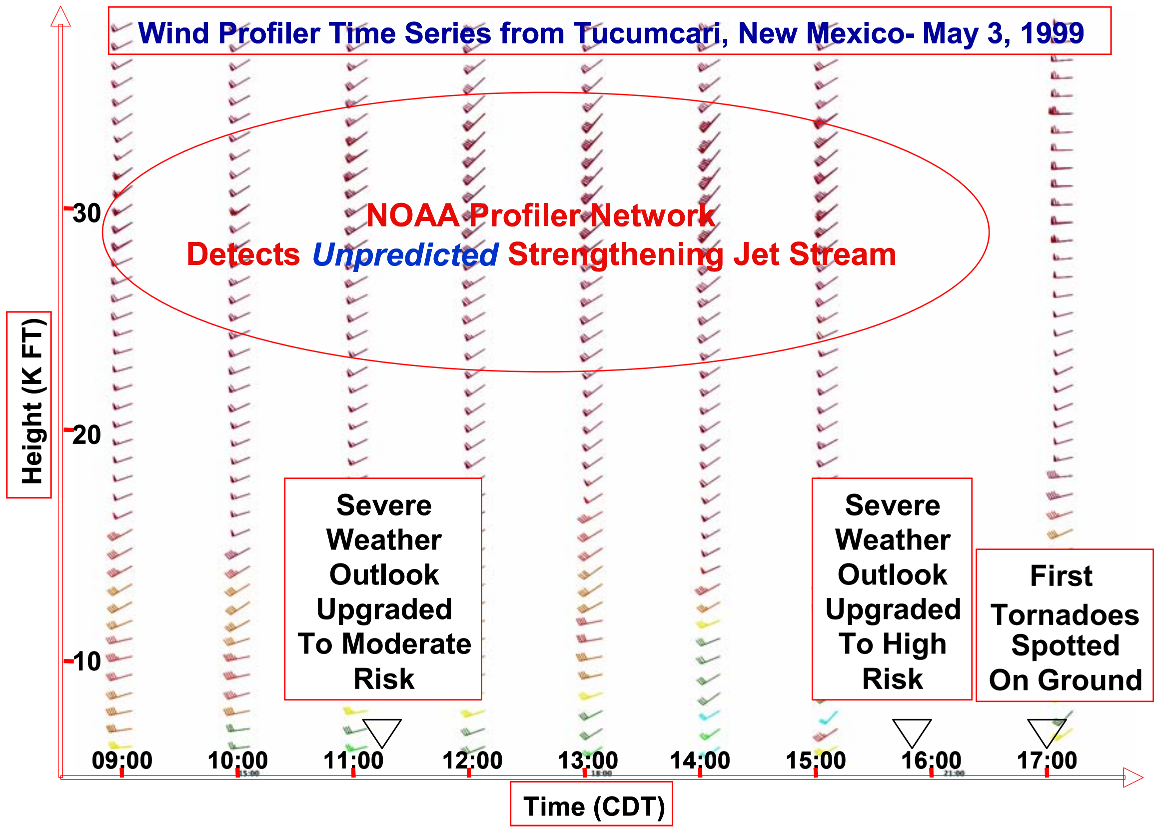
Program: Local Forecasts & Warnings

Highlights

- Began integration of 100+ Cooperative Agency Profilers (CAP) into NPN monitoring activities. Experience gained will be valuable for national profiler network.
- Investigated alternative technologies to reduce data communication costs.
  - GOES High Data Rate (1200 baud)
  - Satellite Internet
- Restored funding and began planning for future with NWS.
- **Produced the COEA requested by Congress.**

Response to the Senate Appropriations Committee

Cost and Operational Effectiveness Analysis for the NOAA Profiler Network



NOAA PROFILER NETWORK

TECHNICAL REVIEW

NPN COEA

Presented by

Thomas W. Schlatter

June 22, 2004

Cost and Operational Effectiveness Analysis (COEA) for the NOAA Profiler Network (NPN)

Presented by Tom Schlatter

Principal contributors: Margot Ackley, Seth Gutman, Jack Hayes, David Helms, Paul Hirschberg, Al Hutchins, Tom Schlatter, and several NWS forecasters.

Origin of the COEA

108TH CONGRESS - *1st Session, 2004*
SENATE REPORT #108–144
DEPARTMENTS OF COMMERCE, JUSTICE, AND STATE, THE JUDICIARY, AND RELATED AGENCIES APPROPRIATION BILL,
Bill: S. 1585. Page 103

NOAA Profiler Network [NPN].—The abrupt decision to shutdown the NPN came as a surprise. Though the Committee is aware that the 404 MHz frequency being used by the NPN will be unavailable by mid-decade, **no analysis has been done to determine the value of the data produced by the NPN, the method and cost of collecting valuable NPN data by other means, or the cost of shutting the NPN down.** Lacking adequate justification, the Committee recommendation funds NPN operations for at least 1 more year. **The NWS is directed to undertake a cost and operational effectiveness analysis [COEA] comparing the $10,000,000 cost to upgrade the NPN over the next decade versus the short, medium, and long-term costs of ending the NPN program.** The COEA shall be delivered to the Committees on Appropriations not later than March 31, 2004.

COEA Outline

(Cost and Operational Effectiveness Analysis)

- What is a wind profiling radar? How does it work?
- Why is a frequency change needed?
- How do NPN data benefit the watch/warning functions and short-range forecasts by humans and computers? (Demonstration of the *value* of the NPN)
- Weighing alternatives to the NPN by means of performance and cost (focus of this presentation)

NPN – NOAA Profiler Network

Scientific and Technical Information Supporting the COEA

Annex A – Resumes of weather professionals who weighted attributes of wind measuring systems by NWS mission

Annex B – Calculation of performance measures – *emphasized in this presentation*

Annex C – Detailed costs of frequency conversion

Annex D – Detailed budget for NPN operations and maintenance

Annex E – Lifetime cost estimates of alternative wind observing systems

Annex F – Detailed costs to terminate the NPN

Annex G – Cost to replicate the NPN Hub

Annex H – COEA language, 108th Congress, Senate Report #108-144

Comprehensive Bibliography on Wind Profiling, 25 pp.

Measuring Performance

NWS missions served by wind profiler observations

- Severe weather warnings
- Severe weather watches
- Short-range forecasts prepared by WFO staff (e.g., special weather statements, nowcasts, aviation forecasts)
- Short-range numerical weather prediction

Measuring Performance

Attributes of wind observing systems that make them valuable:

- Frequency of reporting (how many times per day?)
- Geographical coverage (what fraction of NPN area is covered?)
- Vertical reach (to what altitude can system measure wind?)
- Horizontal spacing (how many observing sites within area included by NPN?)
- Vertical spacing (how many vertical levels?)
- Accuracy (meters per second – used NCEP error specs)

Measuring Performance

Weights assigned to performance attributes by panel of experts

	Short-range forecasts	Watches	Warnings	Short-range NWP
Frequency w_1	.22	.14	.28	.09
Geographical coverage w_2	.19	.26	.15	.27
Vertical reach w_3	.10	.13	.07	.13
Horizontal spacing w_4	.17	.18	.17	.17
Vertical spacing w_5	.14	.13	.13	.13
Accuracy w_6	.18	.16	.20	.21

Measuring Performance

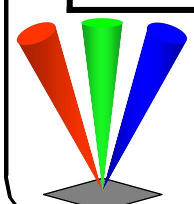
Observing systems capable of measuring wind through a substantial depth of atmosphere

- Wind profiling radars
- Radiosondes
- ACARS/MDCRS (automated reports from commercial jets)
- WSR-88D Doppler radars (Velocity-Azimuth Displays – VADs)
- GOES drift winds (from tracking objects between successive images (visible, infrared, water vapor)
- Wind-finding Lidar aboard a polar orbiting satellite

Measuring Performance

Performance of observing systems that measure wind

Observing System	Frequency (per day)	Percent Coverage	Vertical Reach (km)	Horizontal Spacing[1]	# Levels in Vertical	Accuracy[2] ($m\ s^{-1}$)
Wind-Profiling Radar (NPN)	240	100	15.0	31	59	2.5
Radiosonde	2	100	15.0	25	50	2.2
Hourly Radiosondes	24	100	15.0	25	50	2.2
ACARS/ MDCRS	30	70	12.5	15	10	2.5
WSR-88D Radar	288	98	4.0	53	10	6.0
GOES Drift Winds	24	75	11.0	167	6	2.5
Wind-Finding Lidar	6	60	9.0	24	15	4.0



[1] Horizontal spacing is expressed as the number of observations within the region covered by the NOAA Profiler Network

[2] Estimates from the Environmental Modeling Center (NCEP)

Measuring Performance

Normalized performance measures

Observing System	Frequency (per day) A_1	Percent Coverage A_2	Vertical Reach (km) A_3	Horizontal Spacing A_4	# Levels in Vertical A_5	Accuracy[1] ($m\ s^{-1}$) A_6
Wind-Profiling Radar (NPN)	.83	1.00	1.00	.19	1.00	.88
Radiosonde	.01	1.00	1.00	.15	.85	1.00
Hourly Radiosondes	.08	1.00	1.00	.15	.85	1.00
ACARS/ MDCRS	.10	.70	.83	.09	.17	.88
WSR-88D Radar	1.00	.98	.27	.32	.17	.37
GOES Drift Winds	.08	.75	.73	1.00	.10	.88
Wind-Finding Lidar	.02	.60	.60	.14	.25	.55

[1] To be consistent with the other measures, for which a bigger number is better, the *inverse* of the accuracy must be used here.

Measuring Performance

Formula for the performance measure

$$P = 100\sqrt{w_1 A_1^2 + w_2 A_2^2 + w_3 A_3^2 + w_4 A_4^2 + w_5 A_5^2 + w_6 A_6^2}$$

Calculated for each observing system and each NWS mission

Observing System	Short-Range Forecasts P_1	Watches P_2	Warnings P_3	Short-Range NWP P_4	Average Performance[1] P_{avg}
NPN Profilers	85.3	86.5	84.0	87.2	85.7
Radiosondes	75.8	80.5	71.9	84.1	78.1
Hourly Radiosondes	75.9	80.5	72.1	84.1	78.2
ACARS/MDCRS	55.7	59.0	53.4	62.6	57.7
WSR 88-D Radar	67.5	66.5	69.1	63.9	66.7
GOES Drift Winds	68.8	72.3	67.1	74.6	70.7
Wind-Finding Lidar	41.4	44.8	39.0	46.9	43.0

[1] Average performance: $P_{avg} = (P_1 + P_2 + P_3 + P_4) / 4$

Measuring Performance

Weighted average of performance, where each NWS mission has a different weight:

Short-range forecasts	0.3
Watches	0.2
Warnings	0.4
Short-range NWP	0.1

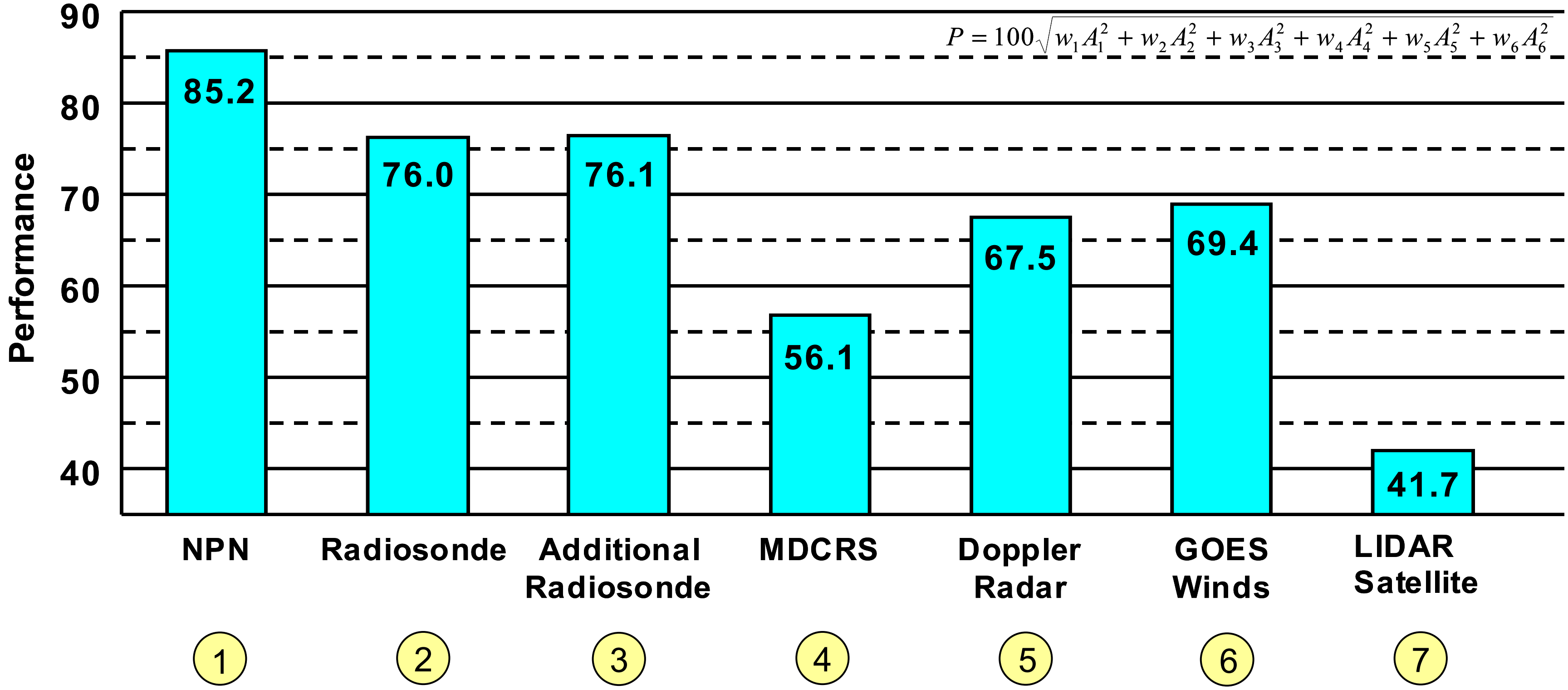
Compare unweighted average $P_{avg} = (P_1 + P_2 + P_3 + P_4) / 4$

with weighted average $P_w = 0.3\,P_1 + 0.2\,P_2 + 0.4\,P_3 + 0.1\,P_4$

Observing System	Unweighted Average	Weighted Average[1]
NPN Profilers	85.7	85.2
Radiosonde	78.1	76.0
Hourly Radiosondes	78.2	76.1
ACARS / MDCRS	57.7	56.1
WSR-88D Radar	66.7	67.5
GOES Drift Winds	70.7	69.4
Wind-Finding Lidar	43.0	41.7

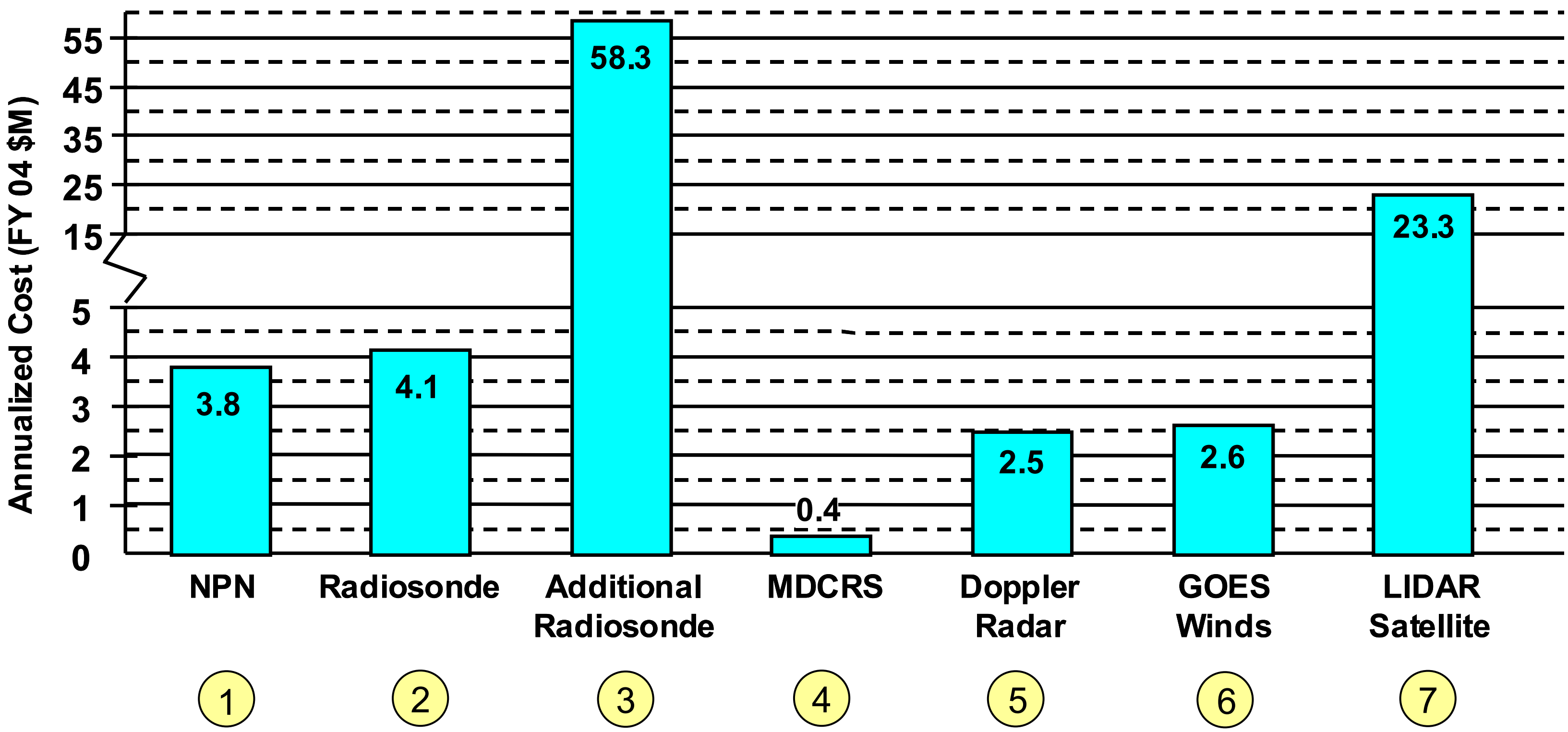
[1] These numbers used in cost / performance comparison that follows.

Performance weighted by NWS mission

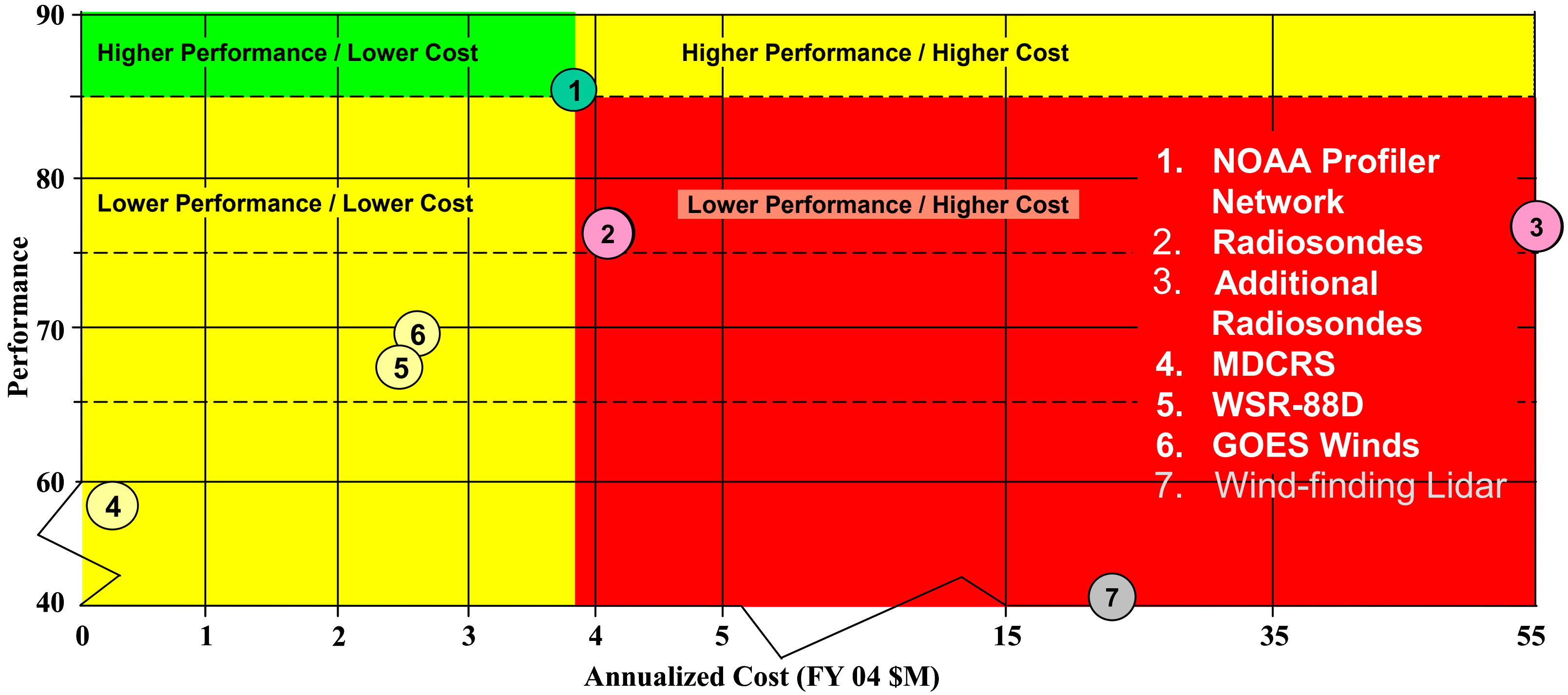


Assessing Costs

Total cost for lifetime of system divided by number of years system is expected to last



Cost / Performance Comparison

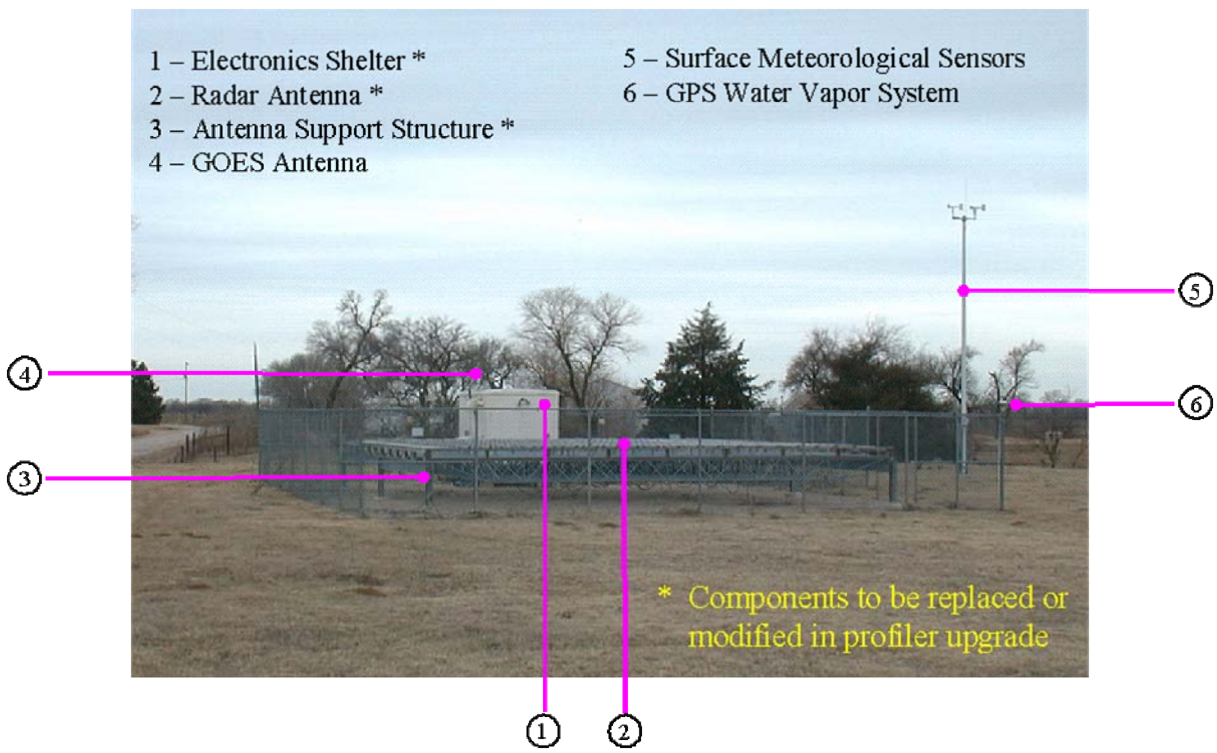


Considering the Alternatives

- Retain the current NOAA Profiler Network and convert to new frequency.
- Shut down the NPN.
- Substitute for the NPN with more radiosonde launches.
- Substitute for the NPN with ACARS / MDCRS automated aircraft reports.
- Substitute for the NPN with WSR-88D Doppler radar data.
- Substitute for the NPN with GOES drift winds.
- Substitute for the NPN with a wind-finding Lidar aboard a polar orbiting satellite

Retain current NPN; change operating frequency.

- $4.1M/yr annual operating cost includes Cooperative Agency Profilers (CAP), ground-based GPS, and engineering enhancements.
- $13.2M to convert to new frequency (449 MHz). Must be completed by the end of 2008.
- Best case: Congress restores NPN earmark and funds conversion. Worst case: NWS funds out of hide.



Shut down the NPN.

- Actions: equipment removal, site clean-up, Hub replacement
- Impacts: degraded warnings, watches, short-term guidance
- Costs
  - $1.7M for shutdown and site restoration
  - $0.6M one-time cost to continue flow of CAP and GPS data and Alaska profiler data
  - $1.2M/year– recurring cost for these data flows

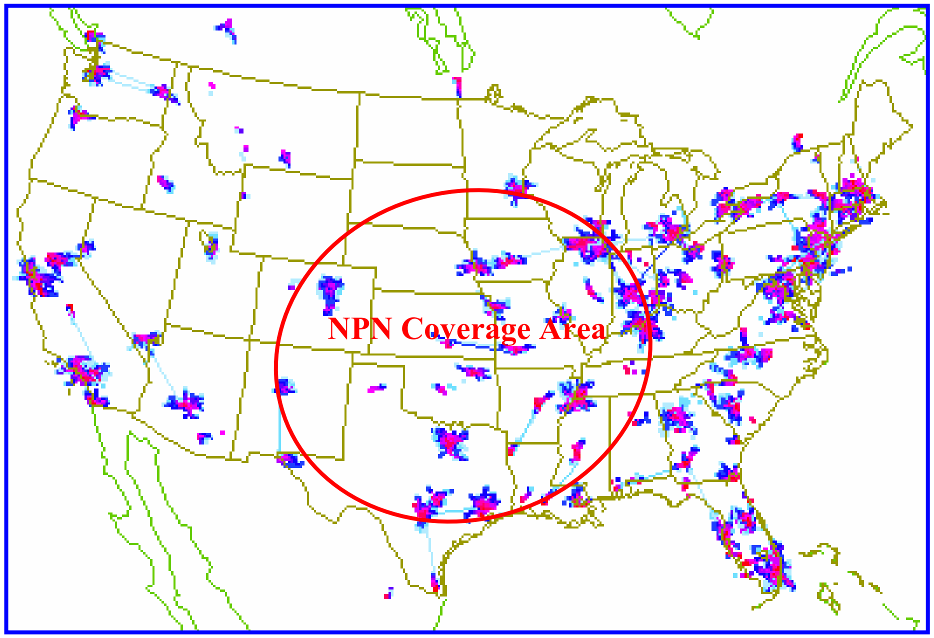
Substitute for NPN with radiosonde data.

- Complete sounding system (T, p, RH, wind) anchors climate record for troposphere and lower stratosphere
- Many mesoscale features missed with only twice-a-day soundings
- Wind accuracy suffers whenever balloon drifts close to the horizon.

- $4.5M annualized cost to operate 25 GPS radiosonde sites within NPN boundaries.
- Hourly launches at same number of sites would cost $54.2M annually

Substitute for NPN with automated aircraft reports.

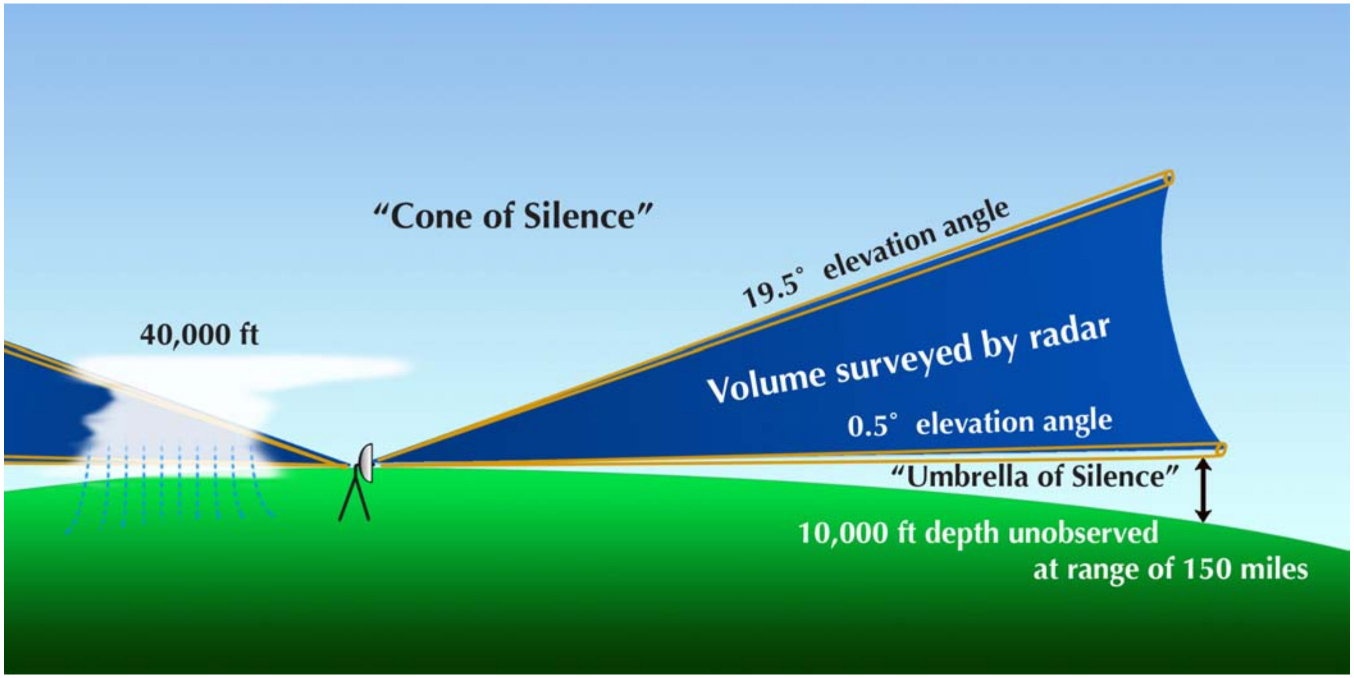
- Commercial aircraft deliver an average of 30 ascent/descent reports per day from the 45 airports nationwide that have at least 5 such reports per day. 15 of these airports lie within NPN. Spatial coverage should improve.
- Coverage differs from hour to hour and between weekends and week days.
- Airlines do not alter schedules or routes to optimize distribution of reports.
- Pilots avoid hazardous weather; weather closes airports, prevents flights.
- Cost of ACARS/MDCRS is low: $0.35M/year, partly because of airlines' good will.



24 Hours of Aircraft Ascent and Descent Reports

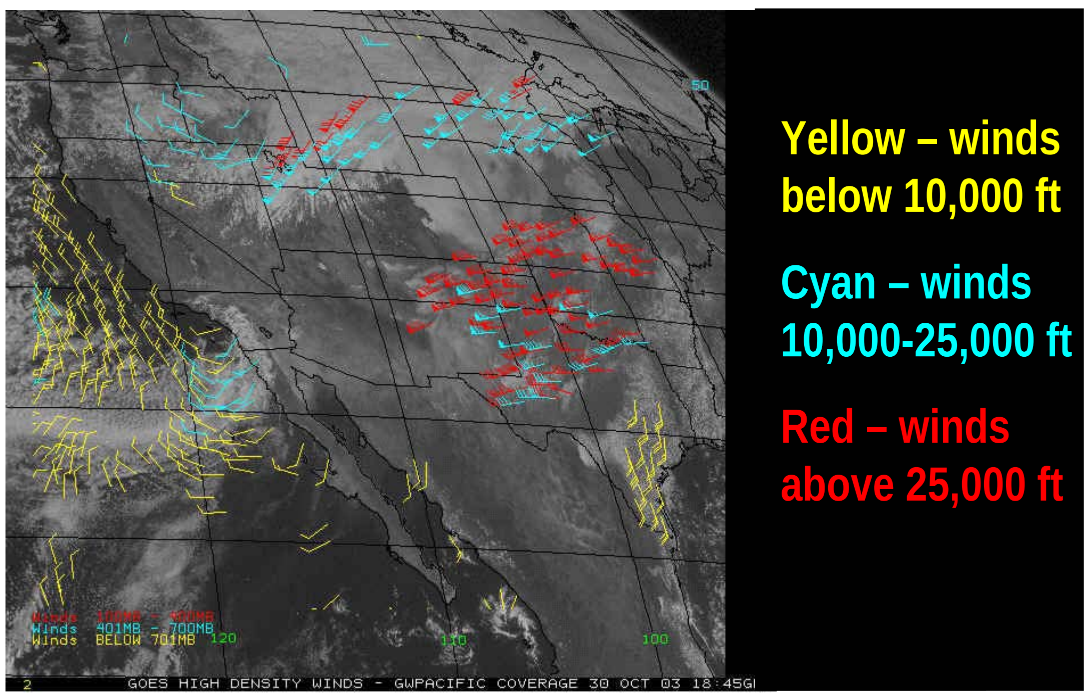
Substitute for NPN with WSR-88D Doppler radars.

- WSR-88D unexcelled for severe storm detection but not designed to deliver vertical profiles of wind in clear weather.
- Velocity-Azimuth Display (VAD) gives good boundary-layer winds in undisturbed conditions when there are clouds or other targets (bugs) sufficiently reflective. Prorated annual cost: $2.5M
- VAD winds seldom go above 10,000 ft in clear air; problems in winter
- Large volumes of atmosphere unobserved.



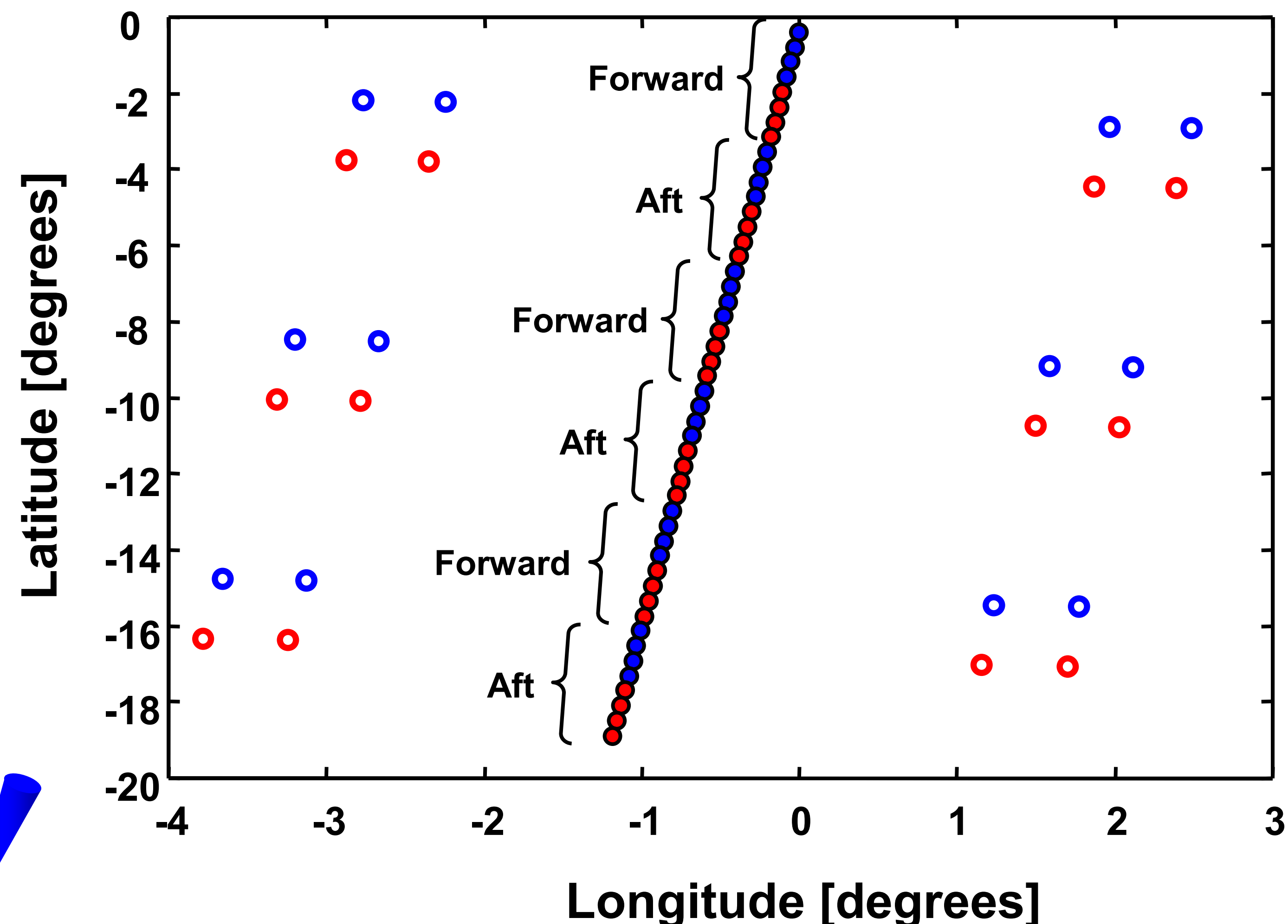
Substitute for NPN with GOES drift wind data.

- Track features in successive GOES images (IR, visible, water vapor) to infer the winds. Prorated annual cost: $2.6M.
- Uncertainty in height of target is major source of error.
- Ability to infer winds depends on presence of suitable targets.
- Drift winds come in clusters; only six distinct reporting layers.
- Stacks of winds in one small area virtually nonexistent



Substitute for NPN with satellite-based wind-finding Lidar.

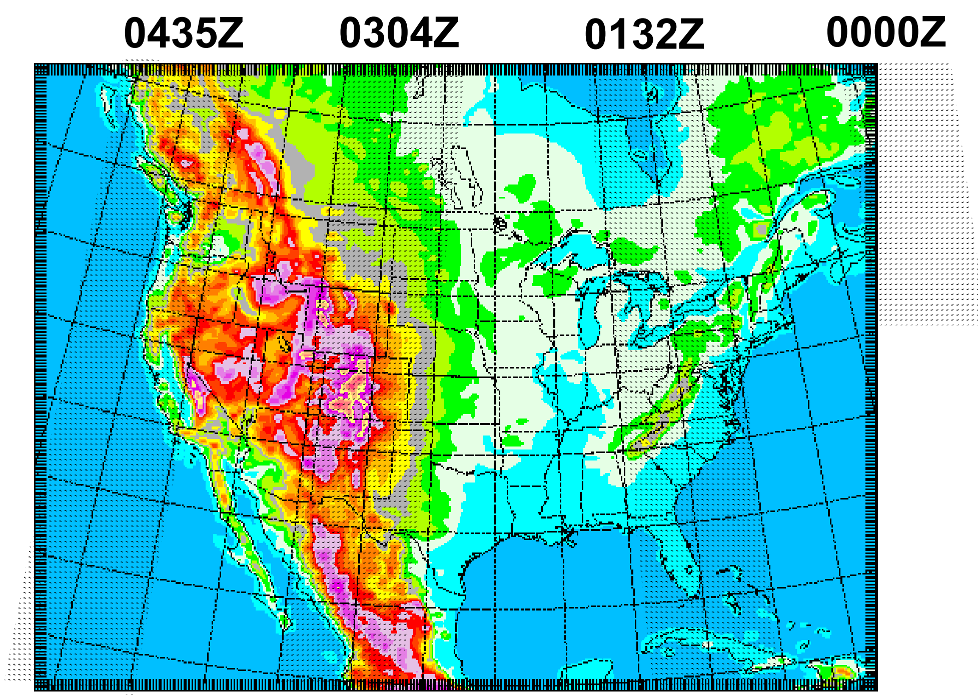
8-POINT SCAN
Nadir Angle: 45°
Shot Pattern



Substitute for NPN with satellite-based wind-finding Lidar.

- With one wind-finding satellite in orbit, three swaths over US at 90-min intervals twice a day. Annualized cost: $23M (conservative estimate)
- A single swath would yield 32 radial wind profiles over U.S. (max of 24 lying within the NPN)
- No measurements below cloud top (exception: thin cirrus)
- Technology still uncertain for hybrid instrument measuring bulk air motion by means of both molecular and aerosol scattering
- Deployment more than a decade away, if ever

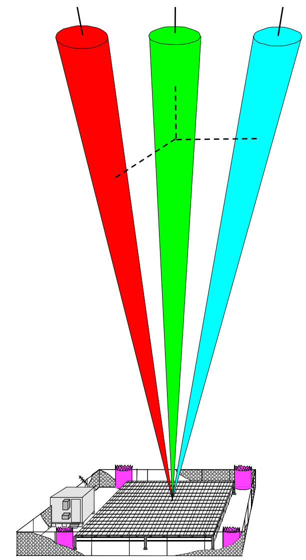
Four data swaths on north-to-south passes



Why not expand the capability of existing systems?

- ***Hourly radiosondes*** (already considered). Raises costs 14-fold to $58M/yr.
- ***Automated aircraft reports***. **Pros**: Can increase number of levels reported on ascent/descent; can involve more airlines, esp. short-hop carriers. **Cons**: Number of airports is fixed; bad weather cancels flights; economic condition of airlines volatile.
- ***WSR-88D Doppler radar***. Wavelength unsuitable for detecting clear-air winds much above 10,000 ft, and then, only in summer, when insects fly.
- ***GOES***. Instrumentation for tracking features fixed for at least ten years; can't see through clouds; difficult to get multiple-level winds in small area.
- ***Wind-finding lidar aboard polar-orbiting satellite***. Very expensive, even for single satellite; coverage of one satellite is poor; clouds block lidar pulses; technology not rigorously proven.

Conclusions

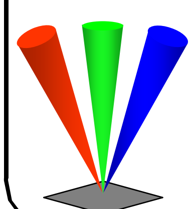


For the four NWS missions considered,

- Warnings
- Watches
- Short-range outlooks issued by WFOs
- Short-range prediction by computer

all of which require upper air wind observations,

"The best combination of performance and cost is to maintain the NPN system and modify its frequency so as not to interfere with reception by SARSAT satellites of signals from Search and Rescue beacons." (COEA language)



The other observing systems considered here have strengths in other NOAA missions. The long-term NOAA goal is a well-integrated upper-air observing system that serves diverse missions.

NOAA PROFILER NETWORK

TECHNICAL REVIEW

Network Status

Presented by

Douglas W. van de Kamp

June 22, 2004

FORECAST SYSTEMS LABORATORY

Demonstration Division
NOAA Profiler Network
&
GPS-MET Network

Margot Ackley, Chief
Debby Bowden, Administrative Asst.

Software Development & Web Services

Alan Pihlak Chief

- Leon Benjamin
- Mike Foy
- Rob Prentice
- Scott Stierle

Facilities Management & Systems Adm.

Jean Tomkowicz Chief

- Jim Bussard
- Mike Pando

Network Operations

Doug van de Kamp Chief

- Norm Abshire
- Mike Bowden
- Jim Budler
- Daphne Grant

Engineering & Field Support

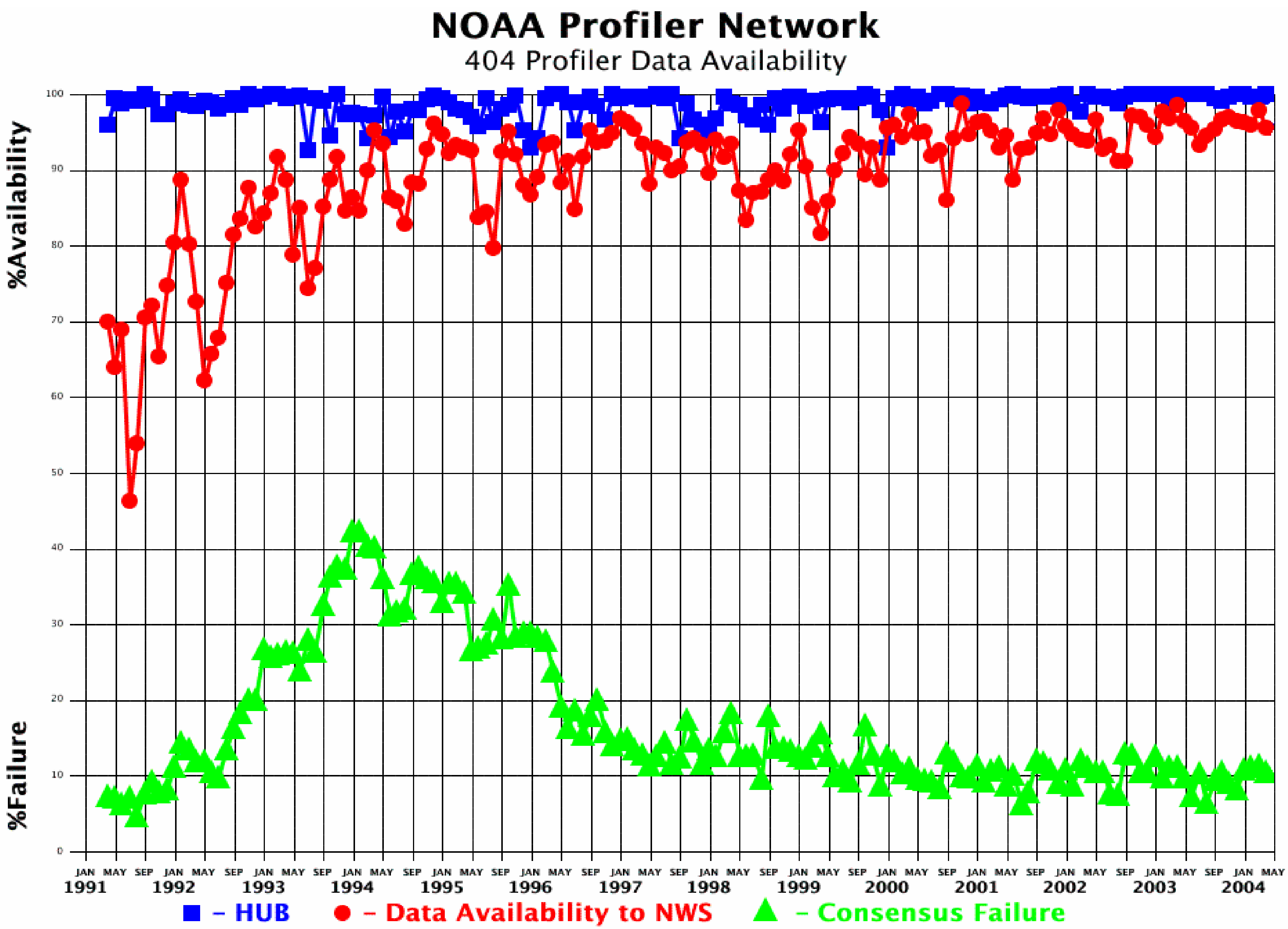
Mike Shanahan Chief

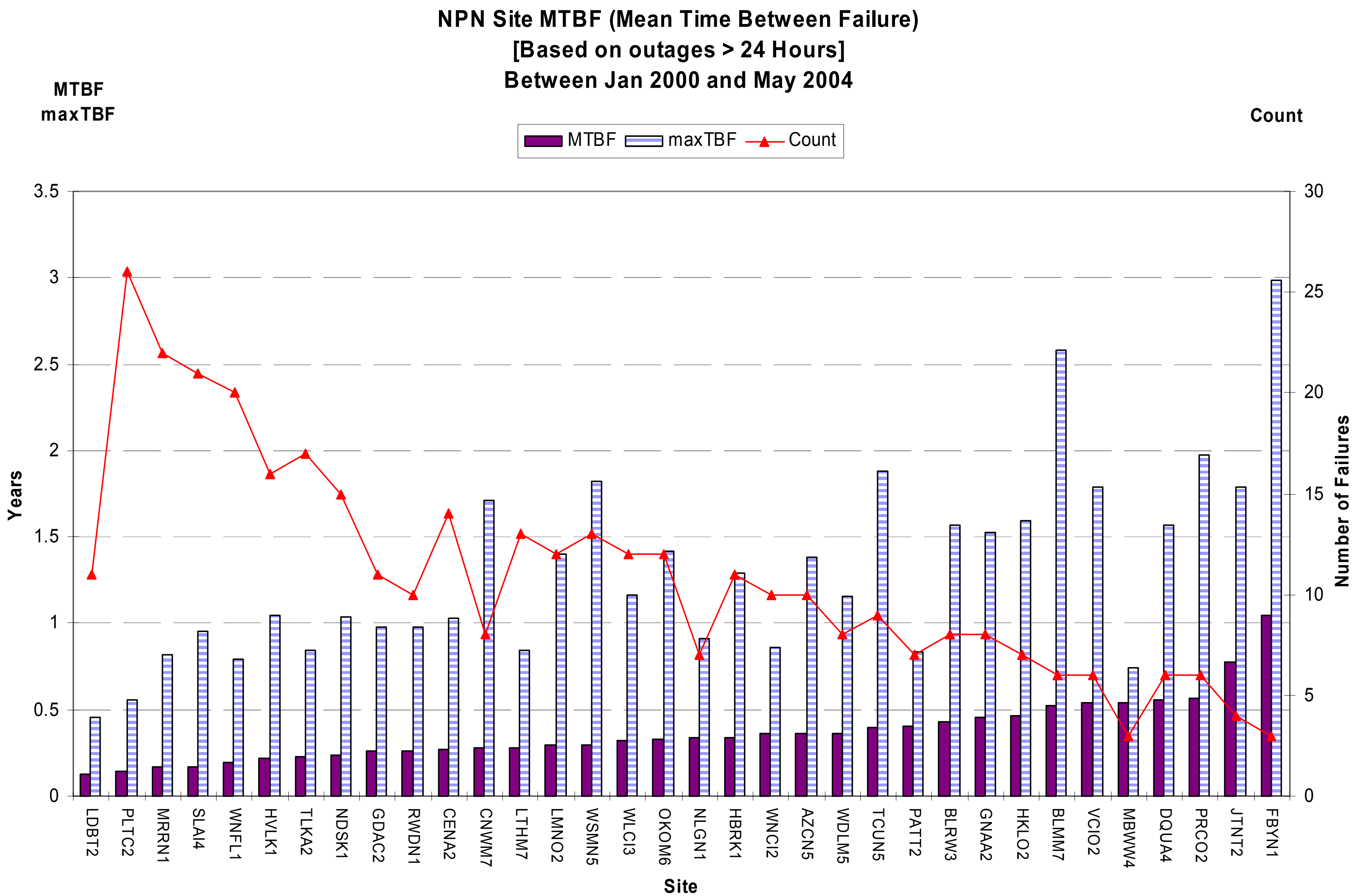
- Norm Abshire
- Mac Carrithers
- Dave Glaze
- Brian Koonsvitsky
- Brian Phillips
- Richard Strauch
- David Wheeler

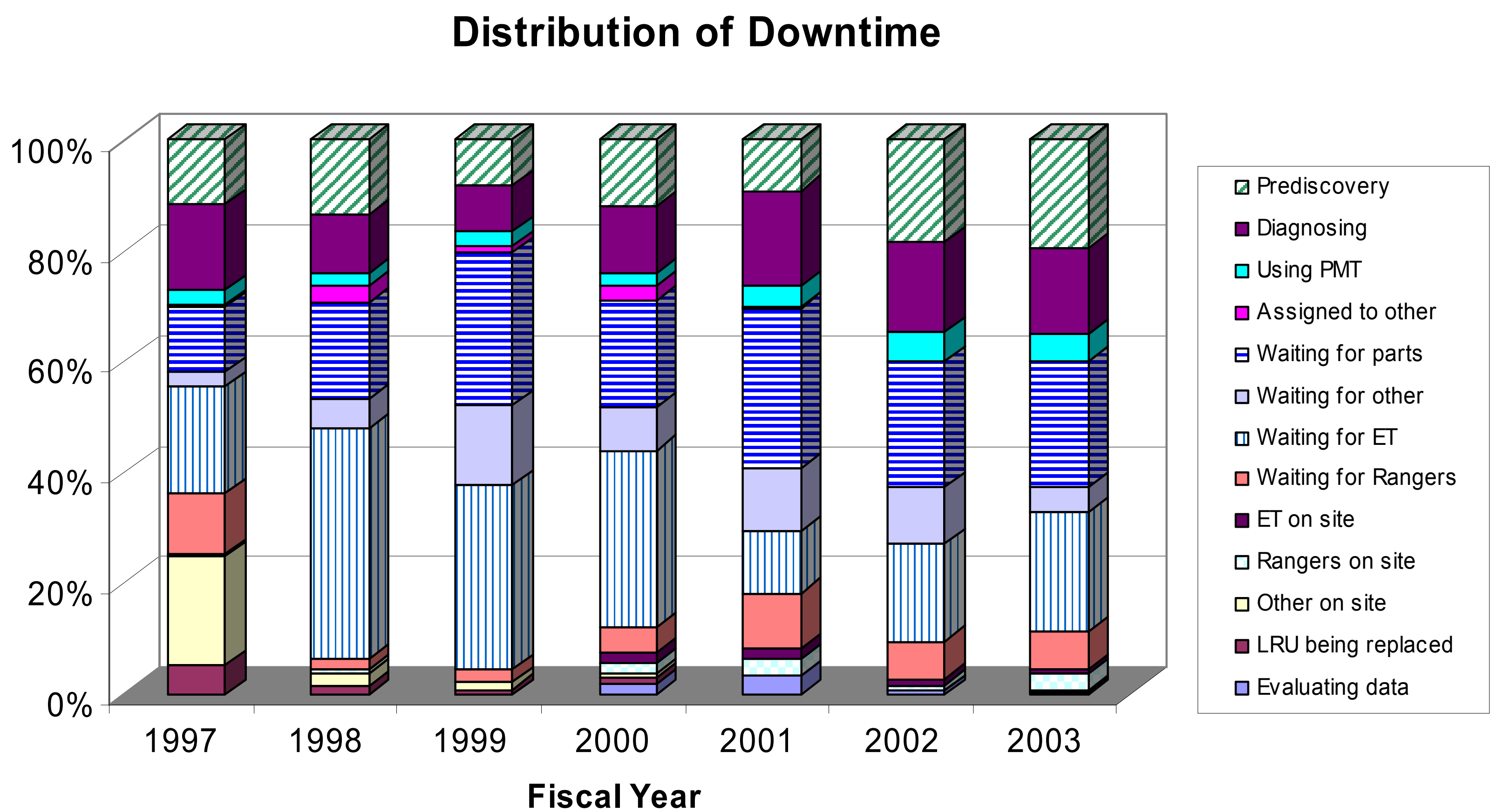
GPS-MET Systems

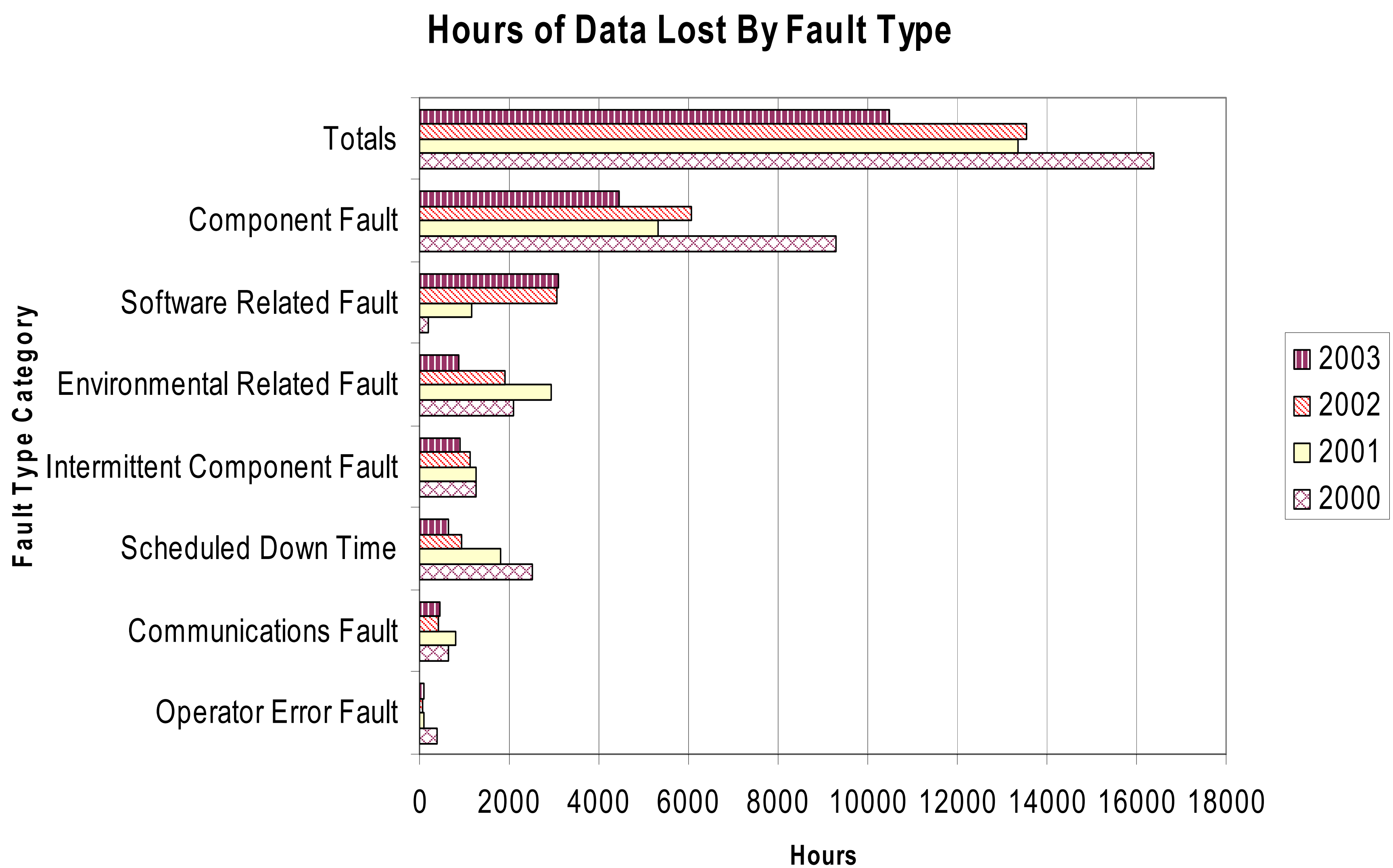
Seth Gutman Chief

- Kirk Holub
- Susan Sahm


NOAA Profiler Network
404 Profiler Data Availability
%Availability
%Failure
100
90
80
70
60
50
40
30
20
10
0
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
■ – HUB
● – Data Availability to NWS
▲ – Consensus Failure


NPN Site MTBF (Mean Time Between Failure)
[Based on outages > 24 Hours]
Between Jan 2000 and May 2004
MTBF
maxTBF
Count
MTBF
maxTBF
Count
Years
Number of Failures
Site
0
0.5
1
1.5
2
2.5
3
3.5
0
5
10
15
20
25
30
LDBT2
PLTC2
MRRN1
SLAI4
WNFL1
HVLK1
TLKA2
NDSK1
GDAC2
RWDN1
CENA2
CNWM7
LTHM7
LMNO2
WSMN5
WLCI3
OKOM6
NLGN1
HBRK1
WNCI2
AZCN5
WDLM5
TCUN5
PATT2
BLRW3
GNAA2
HKLO2
BLMM7
VCIO2
MBWW4
DQUA4
PRCO2
JTNT2
FBYN1


Distribution of Downtime
100%
80%
60%
40%
20%
0%
1997
1998
1999
2000
2001
2002
2003
Fiscal Year
Prediscovery
Diagnosing
Using PMT
Assigned to other
Waiting for parts
Waiting for other
Waiting for ET
Waiting for Rangers
ET on site
Rangers on site
Other on site
LRU being replaced
Evaluating data


Hours of Data Lost By Fault Type
Fault Type Category
Totals
Component Fault
Software Related Fault
Environmental Related Fault
Intermittent Component Fault
Scheduled Down Time
Communications Fault
Operator Error Fault
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Hours
2003
2002
2001
2000

Ongoing Activities

- **Operations and monitoring of 35 NPN sites.**
  - **Fault tracking**
  - **Coordination of Logistics**
  - **Radio Acoustics Sounding Systems (RASS) at 11 NPN sites**
  - **GPS receiver and surface observations**
- **Monitoring of 250+ GPS systems.**
- **Monitoring of ~ 100 CAP systems.**
- **Search and Rescue Satellite-Aided Tracking.**

  (SARSAT inhibit schedule generation)

Ongoing Activities – Cont'd.

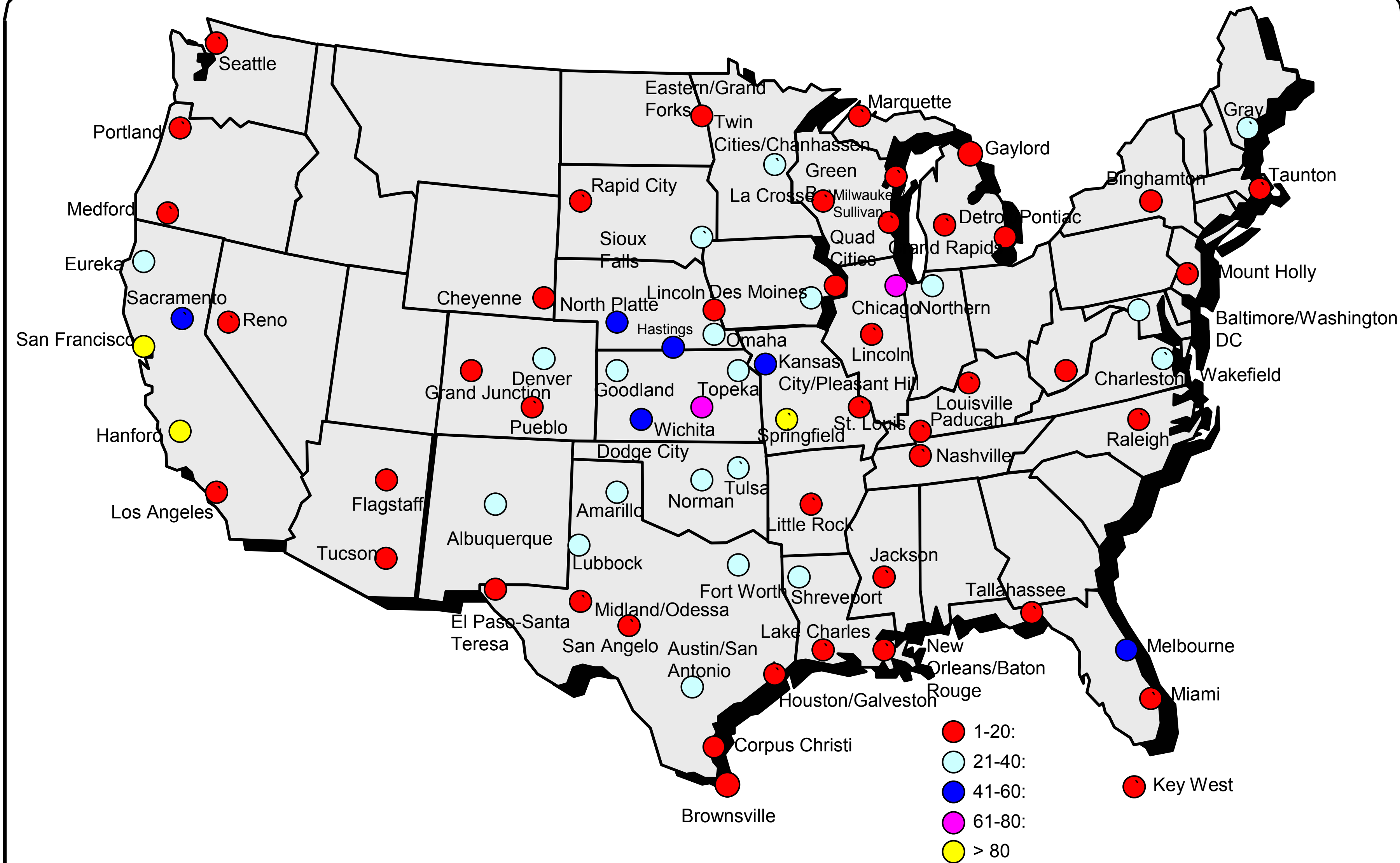
- Remote main power reset capability.
  - Attempted 208 times in FY03, successful 168 times (81%)
  - 4,400+ hours of additional profiler and GPS IPW data
  - Increased NPN data availability by 1.6%.
- No SARSAT interference – many years now.
- Investigating reduced SARSAT inhibit angles.
- Platteville 449 MHz.
  - Two processing methods
  - Three beam vs. five beam processing
- Ground clutter mitigation.
- Monitoring NWS Area Forecast Discussions (AFD).

Ongoing Activities cont’d.

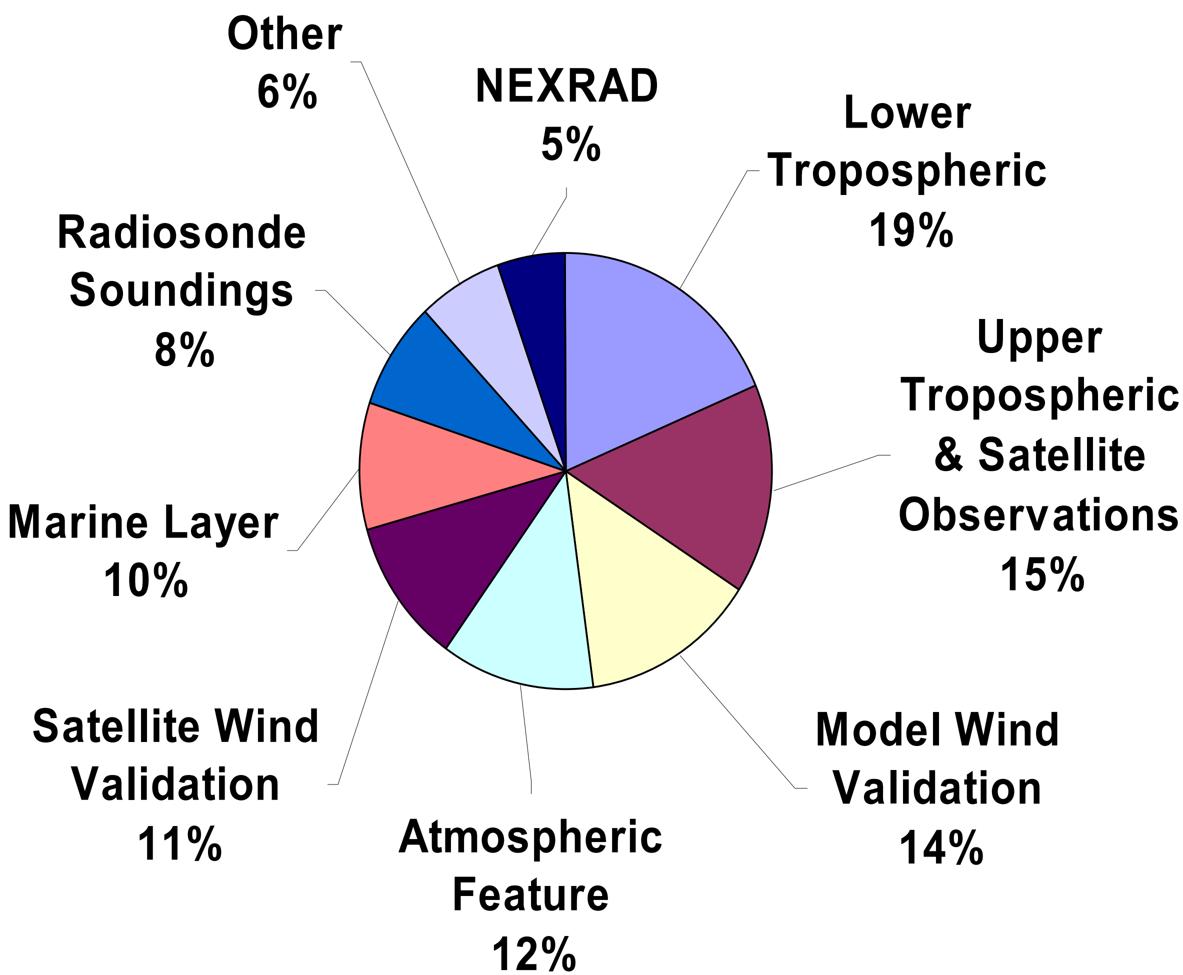
- Participated in GOES Interference Test.
- Investigating ultrasonic speakers for RASS.
- Training and Outreach activities.
  - Update of Training Manual #1 for NWS/COMET program.
- Improved web displays.
  - Data display
  - Monitoring activities
- Data quality issues.
  - Ground clutter
  - Internal interference
  - Birds
- National Profiler Network Planning.

NOAA Profiler Network

Forecast Systems Laboratory
Demonstration Division



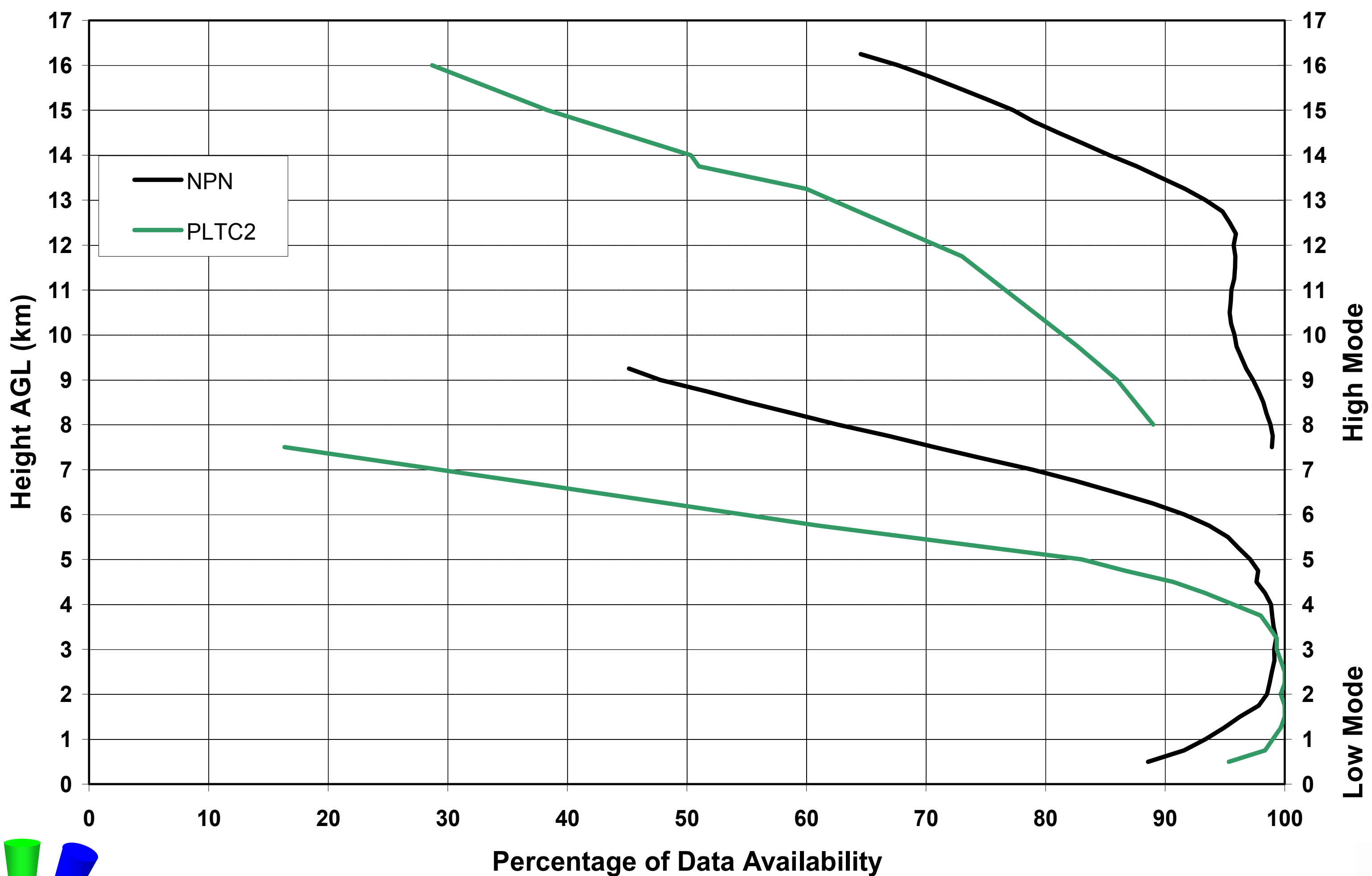
NWS offices identifying use of Profiler data in their Area Forecast Discussions (290 day period, January 15, 2003 to October 31, 2003)

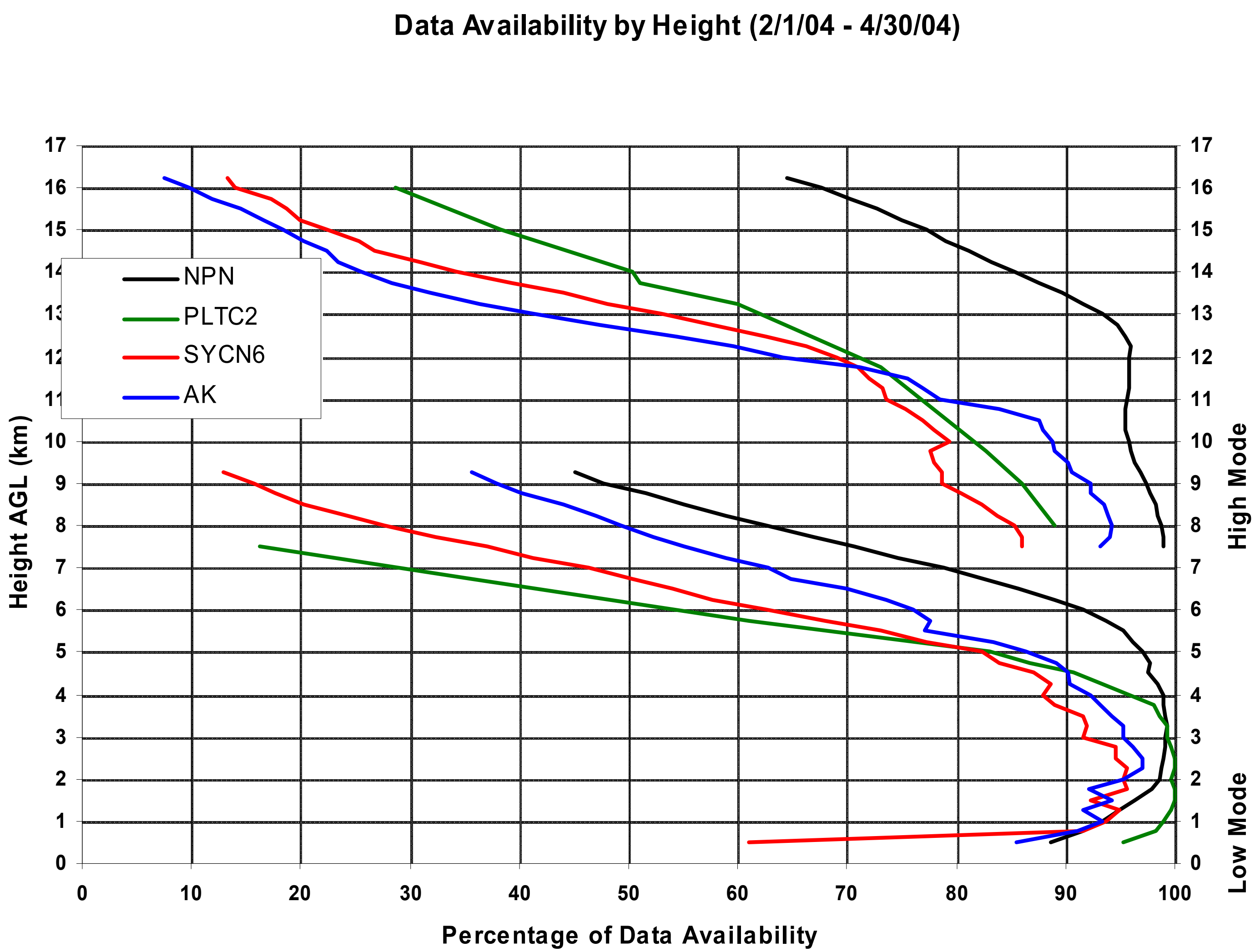

Other
6%
NEXRAD
5%
Lower Tropospheric
19%
Radiosonde Soundings
8%
Upper Tropospheric & Satellite Observations
15%
Marine Layer
10%
Satellite Wind Validation
11%
Atmospheric Feature
12%
Model Wind Validation
14%

NOAA Profiler Network

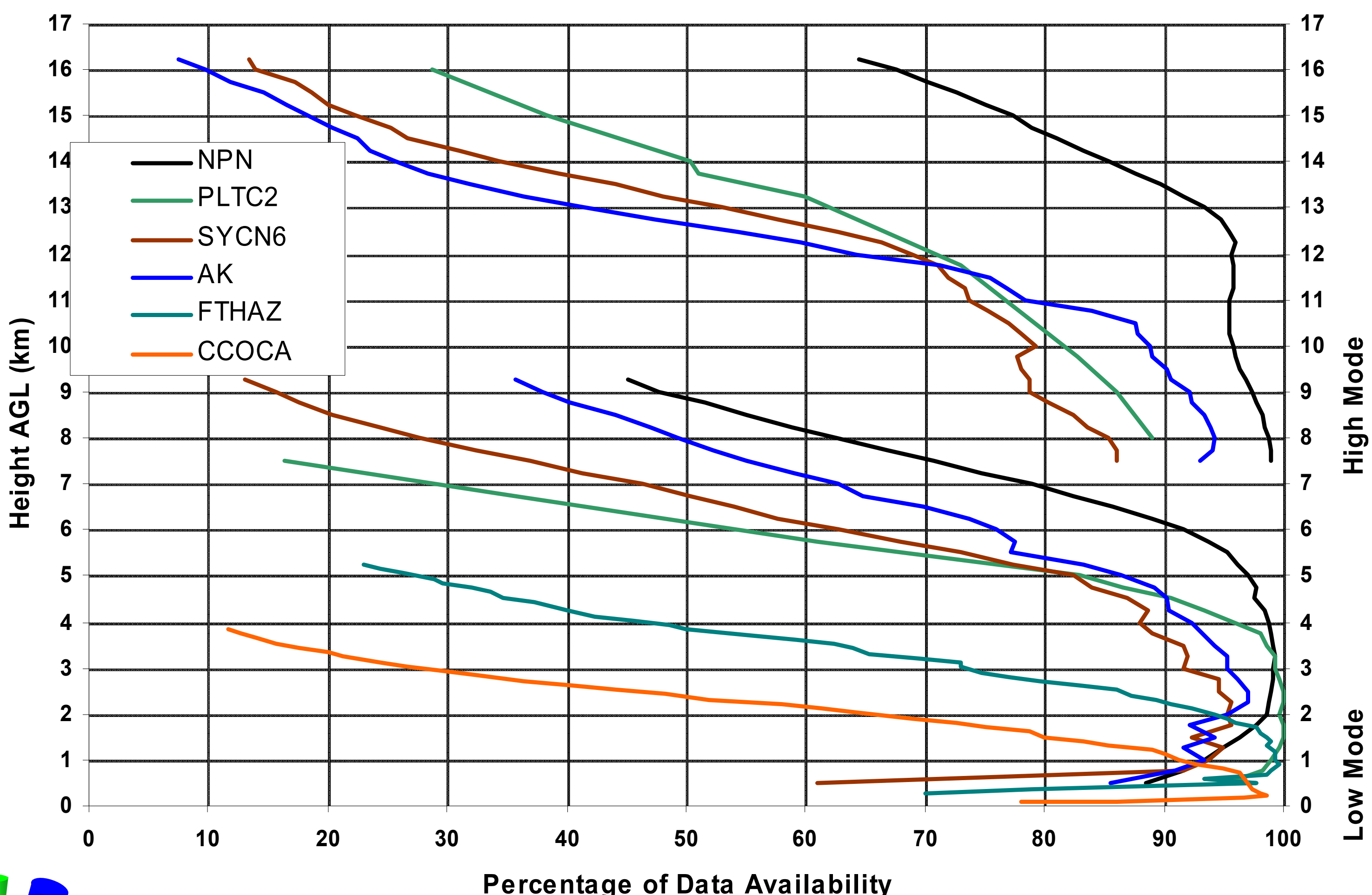
Forecast Systems Laboratory
Demonstration Division

Data Availability by Height (2/1/04 - 4/30/04)




Data Availability by Height (2/1/04 - 4/30/04)
NPN
PLTC2
SYCN6
AK
Height AGL (km)
Percentage of Data Availability
0
10
20
30
40
50
60
70
80
90
100
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
High Mode
Low Mode

Data Availability by Height (2/1/04 - 4/30/04)



Future Activity

- Improve data quality
  - Bird rejection
  - Ground clutter
  - Internal interference
- Acquire more CAP data
- Automated QA monitoring
- Improve RASS QA and display
- Automate remote main power resets
- Investigate additional profiler products
- National Profiler Network Planning

NOAA PROFILER NETWORK TECHNICAL REVIEW

Facilities and System Administration
and
Software Development
and
Web Services

Presented by

Alan E. Pihlak

June 22, 2004

FORECAST SYSTEMS LABORATORY

Demonstration Division
NOAA Profiler Network
&
GPS-MET Network

Margot Ackley, Chief
Debby Bowden, Administrative Asst.

Software Development & Web Services
Alan Pihlak
Chief
Leon Benjamin
Mike Foy
Rob Prentice
Scott Stierle

Facilities Management & Systems Adm.
Jean Tomkowicz
Chief
Jim Bussard
Mike Pando

Network Operations
Doug van de Kamp
Chief
Norm Abshire
Mike Bowden
Jim Budler
Daphne Grant

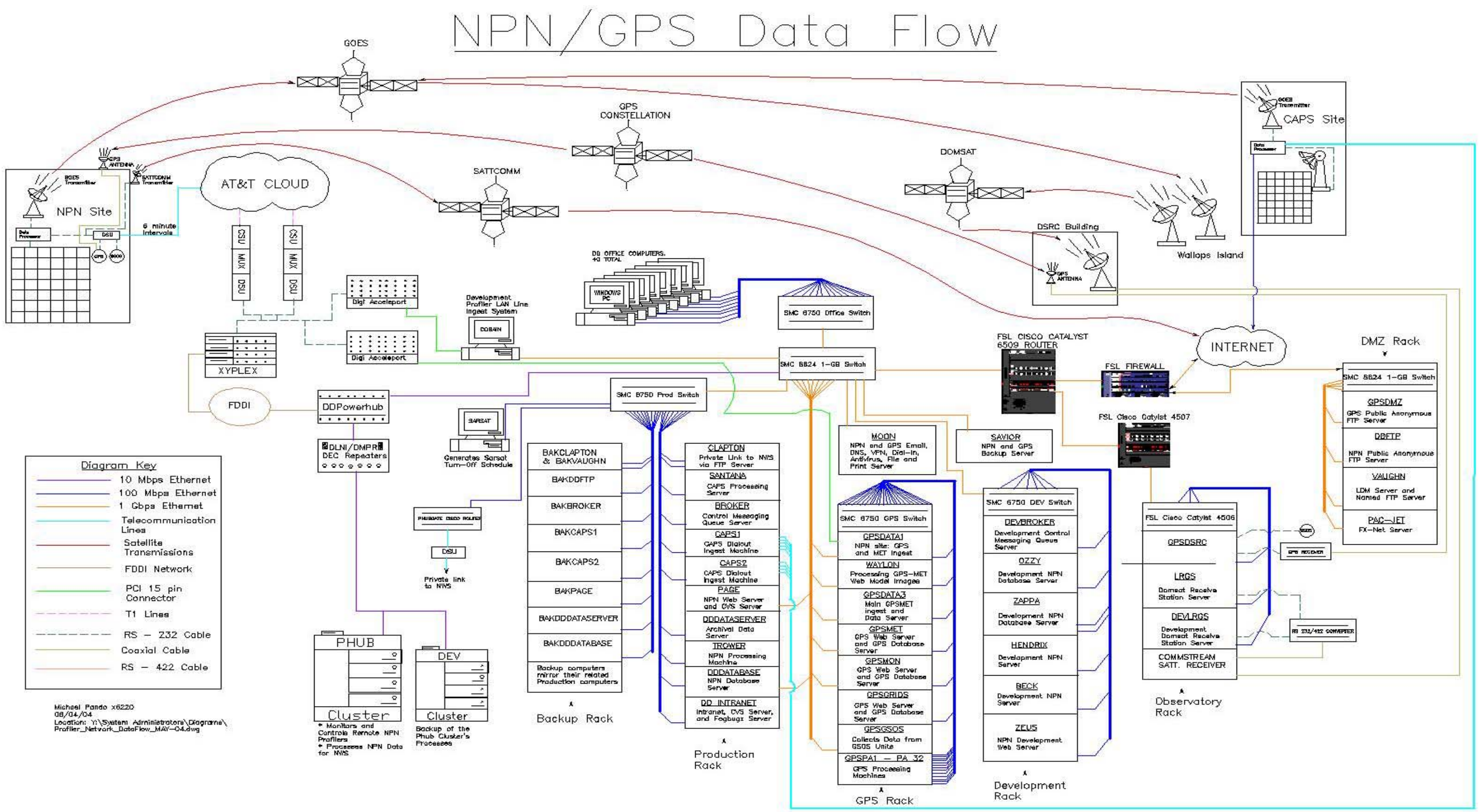
Engineering & Field Support
Mike Shanahan
Chief
Norm Abshire
Mac Carrithers
Dave Glaze
Brian Koonsvitsky
Brian Phillips
Richard Strauch
David Wheeler

GPS-MET Systems
Seth Gutman
Chief
Kirk Holub
Susan Sahm

Facilities Branch

- System administration and network security
- Physical plant maintenance
- Purchasing and contracts
- 16/7 pager coverage

Current Configuration



Facilities Branch

- Processing
  - 73 Linux based systems:
    - > 60 RedHat Community
    - > 13 RedHat Enterprise
  - 2 Vax clusters running VMS
  - 7 Windows XP Pro
- Office
  - 36 Windows XP Pro
  - 1 Windows 2000 Advanced Server: Domain Controller and email server running Exchange 2000
  - 2 Windows 2000 Pro

Facilities Branch

- Networking:
  - 4 Layer 2 SMC 8624 Gbps Ethernet redundant switches
  - 5 Layer 2 SMC 6750 Mbps Ethernet redundant switches
  - Require customized VLANs for security.
  - 1 Netscreen Virtual Firewall
  - Redundant uplinks to FSL Cisco Catalyst 6509 Routers
  - 1 Fore Runner 9100 PowerHub Router
  - 5 DEC DELNI/DMPR 10 Mbps Repeaters
  - 1 Xyplex Terminal server
  - 2 Digi Acceleport Switches

Facilities Branch

- Physical Plant
  - 40 KVA UPS in production computer room
  - Liebert 15 ton updraft chilled water computer room air conditioner

Accomplishments in Facilities

- Production systems RedHat upgraded
- Batteries replaced in power conditioner
- Computer room cabling reorganized
- Currently running RedHat Enterprise in development mode
- Enterprise upgrade scheduled week of June 28, <u>depending on critical weather</u>

FORECAST SYSTEMS LABORATORY

Demonstration Division
NOAA Profiler Network
&
GPS-MET Network

Margot Ackley, Chief
Debby Bowden, Administrative Asst.

Software Development & Web Services

Alan Pihlak Chief

Leon Benjamin
Mike Foy
Rob Prentice
Scott Stierle

Facilities Management & Systems Adm.

Jean Tomkowicz Chief

Jim Bussard
Mike Pando

Network Operations

Doug van de Kamp Chief

Norm Abshire
Mike Bowden
Jim Budler
Daphne Grant

Engineering & Field Support

Mike Shanahan Chief

Norm Abshire
Mac Carrithers
Dave Glaze
Brian Koonsvitsky
Brian Phillips
Richard Strauch
David Wheeler

GPS-MET Systems

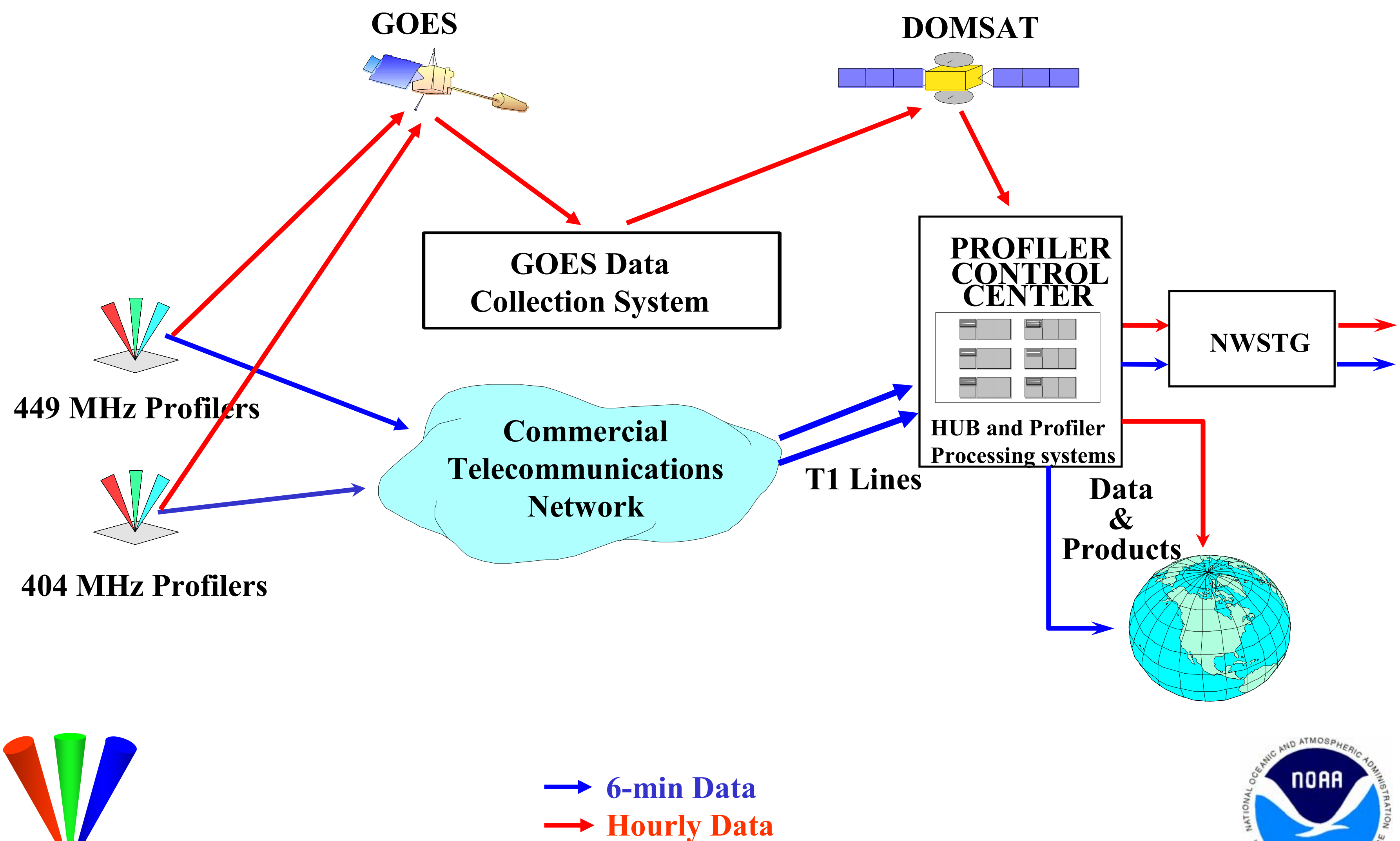
Seth Gutman Chief

Kirk Holub
Susan Sahm

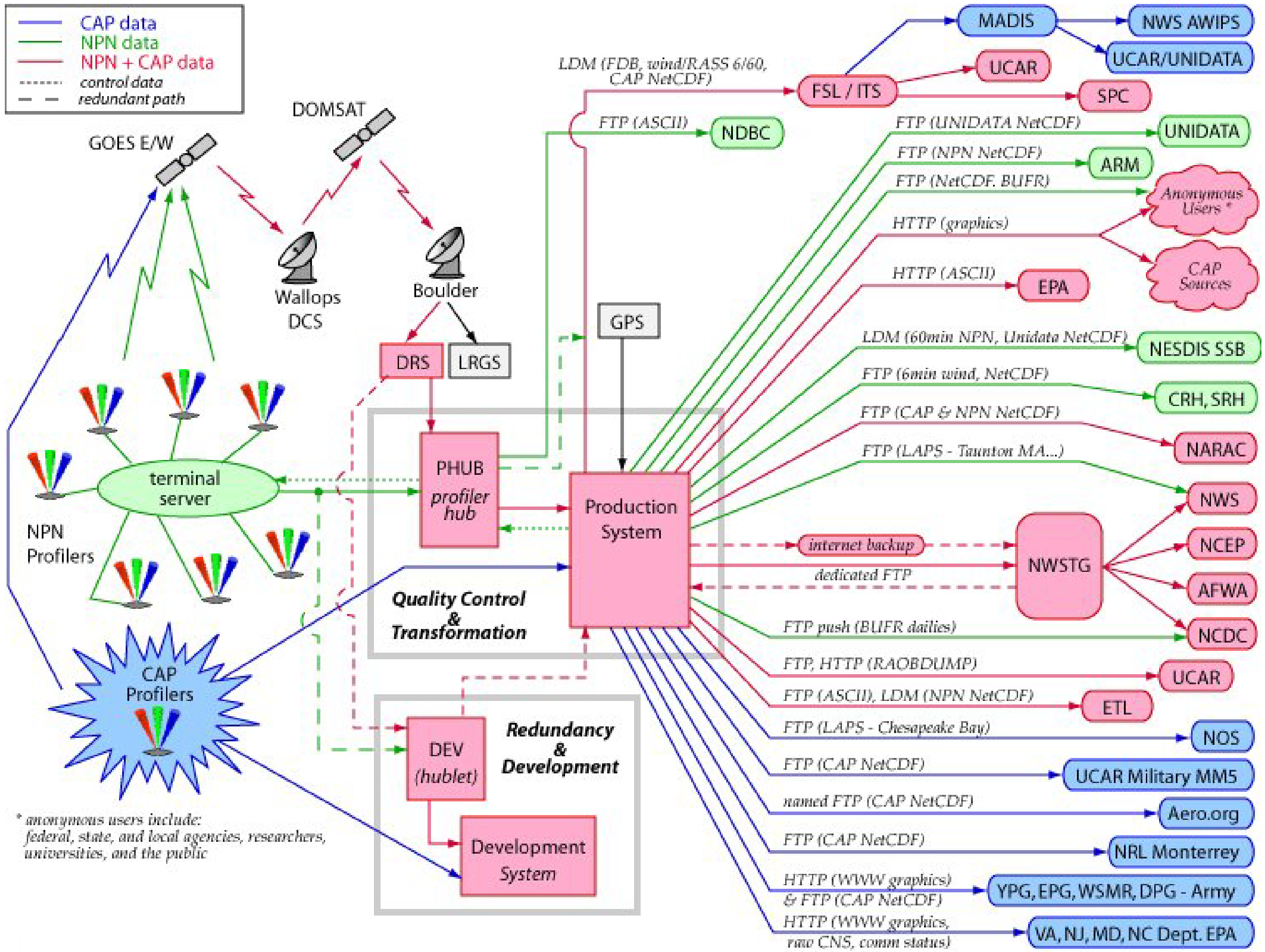
Software Development and Web Services Branch

- **Maintaining www.profiler.noaa.gov as the primary web site regarding profiler information from the NPN and CAP profiler networks**
- **Continue to work to replace the 1980's era VAX clusters**
- **Operating the CAP acquisition system and processing**

NOAA Profiler Network Data Flow - Overview



NOAA Profiler Network Data Flow - Detail



* anonymous users include: federal, state, and local agencies, researchers, universities, and the public

Data Distribution By Type

	WMO BUFR (SBN,GTS)	NPN NetCDF (LDM,FTP)	CAP NetCDF (LDM,FTP)	Other
NWS	X	X		
NCEP	X			
SPC		X	X	
NARAC		X	X	
NCDC	X			
AFWA	X			
FSL/ITS		X	X	
Others		X	X	X

Distributed System Components

Wind Profiler Processing and Control

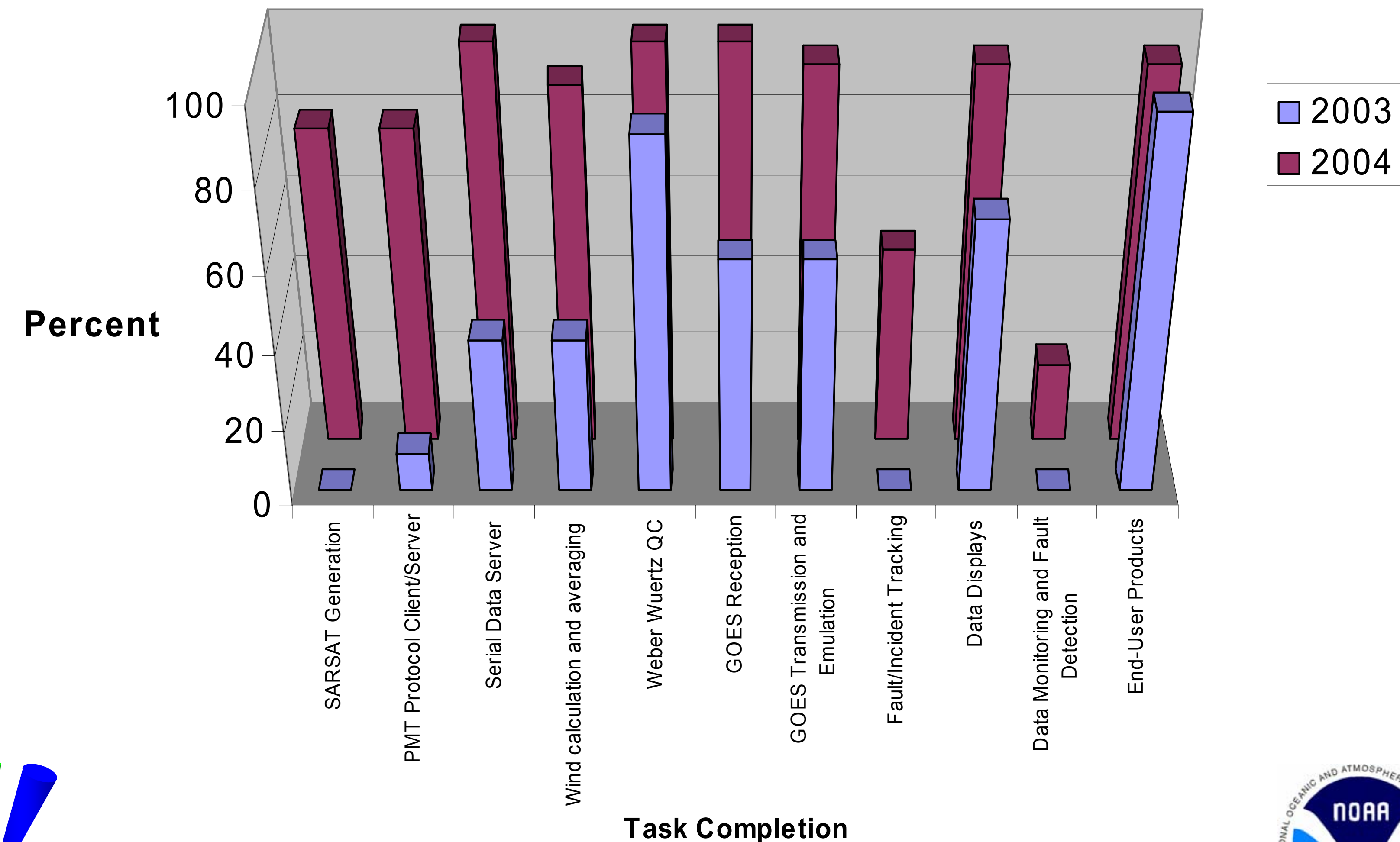
- QC – Weber-Wuertz, bird, others
- Wind calculation and averaging
- Data displays
- GOES transmission and emulation
- WMO formatted messages
- PMT protocol server
- Serial data server

Monitoring and Diagnostics

- Fault tracking
- Data displays
- WWW displays and data
- SARSAT generation (404 MHz only)
- Data distribution
- PMT protocol client
- Serial data client

Red Hat Linux, PostgreSQL, Apache

Hub Replacement Tasks 2003 vs 2004



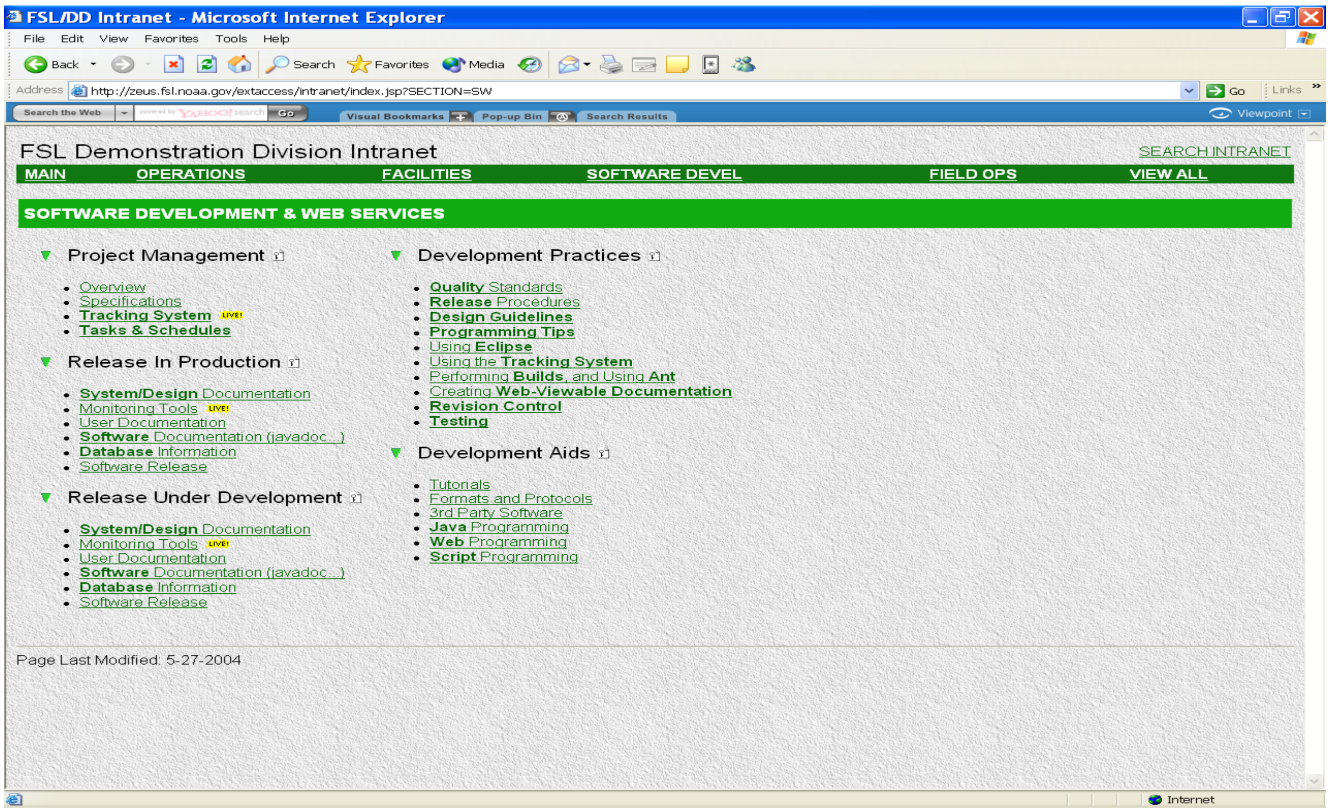
HUB- 2003

HUB- 2004

Other Accomplishments

- Eliminated aging SUN components
- Web site split into two parts: DD site and NPN site
- Both sites were given a new look and feel
- Effort to organize all internal NPN documentation on a single intranet continues

Intranet Documentation Example



Cooperative Agency Profilers (CAP)

- The good: ~100 CAP profilers delivering data (~30 stations non-CONUS). NWS AFDs often mention CAPs

- The bad: approximately 30% of branch resources spent operating CAP network as the number of CAP profilers increased from 2000 (30) to 2002 (60) to 2004 (100)

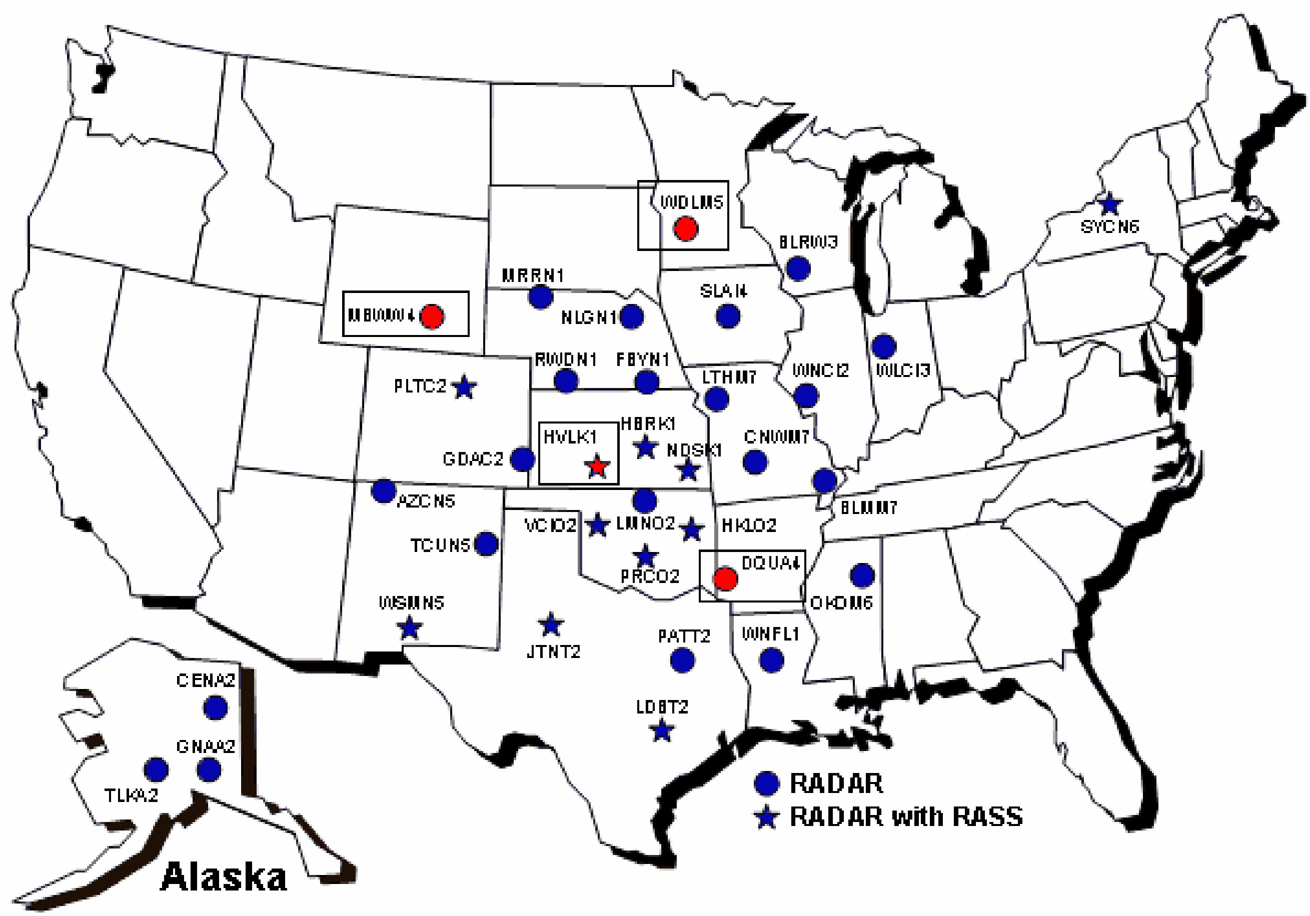
High-Performance Computing and Communications

- In 2003, DD made a proposal to the HPCC to test and evaluate satellite internet communications at NPN profiler sites
- The proposal was accepted and funds were used to purchase satellite communications hardware and to pay for services at 4 wind profiler sites.

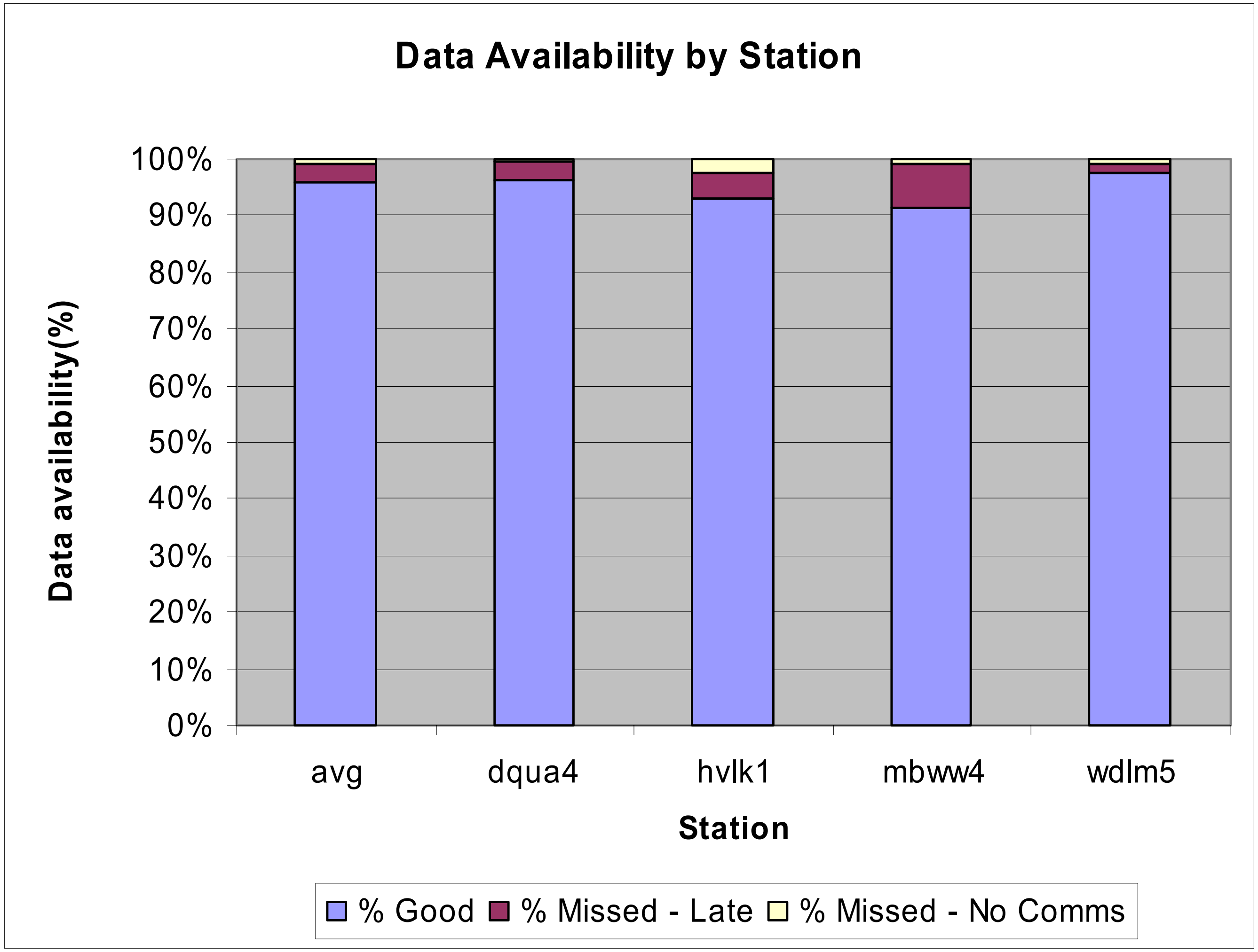
HPCC Proposal

- Determine reliability for 24x7x365 operations at sites with very different annual weather.
- Determine near & long term cost effectiveness
  - Seeking lower cost, higher bandwidth communications for the existing NPN.
    - If successful, 50% savings over current landline communications costs
  - Supports utilizing sites for additional instrumentation
- Determine viability for possible NPN expansion

Test System Locations



Data Availability



Initial Test Results

- Data Availability is 3.5% less than NPN AT&T dedicated landline communication system.
- Data Latency is within 25 seconds of current landline data for 90% of data.
- Cost is approximately 50% of current.
- Test to be extended at the 4 sites for another year to better determine the effects of weather on this method.

Summary

- Facilities and SD&WS provide essential services.
- Support collection and processing of near-real time data from ~135 stations, including upper-air and temperature profiles, and surface measurements.
- Provide data to a number of discrete organizations, including NWS, NCEP, SPC.
- Homeland Security related groups include NARAC and AFWA.
- Plan to have HUB replacement system operating in parallel by October 2004.
- Satellite communications appears to be a low-cost, reliable alternative to landline communications.

NOAA PROFILER NETWORK
TECHNICAL REVIEW

Engineering & Field Support

Presented by

Michael K. Shanahan

June 22, 2004

FORECAST SYSTEMS LABORATORY

Demonstration Division
NOAA Profiler Network
&
GPS-MET Network

Margot Ackley, Chief
Debby Bowden, Administrative Asst.

Software Development & Web Services

Alan Pihlak Chief

- Leon Benjamin
- Mike Foy
- Rob Prentice
- Scott Stierle

Facilities Management & Systems Adm.

Jean Tomkowicz Chief

- Jim Bussard
- Mike Pando

Network Operations

Doug van de Kamp Chief

- Norm Abshire
- Mike Bowden
- Jim Budler
- Daphne Grant

Engineering & Field Support

Mike Shanahan Chief

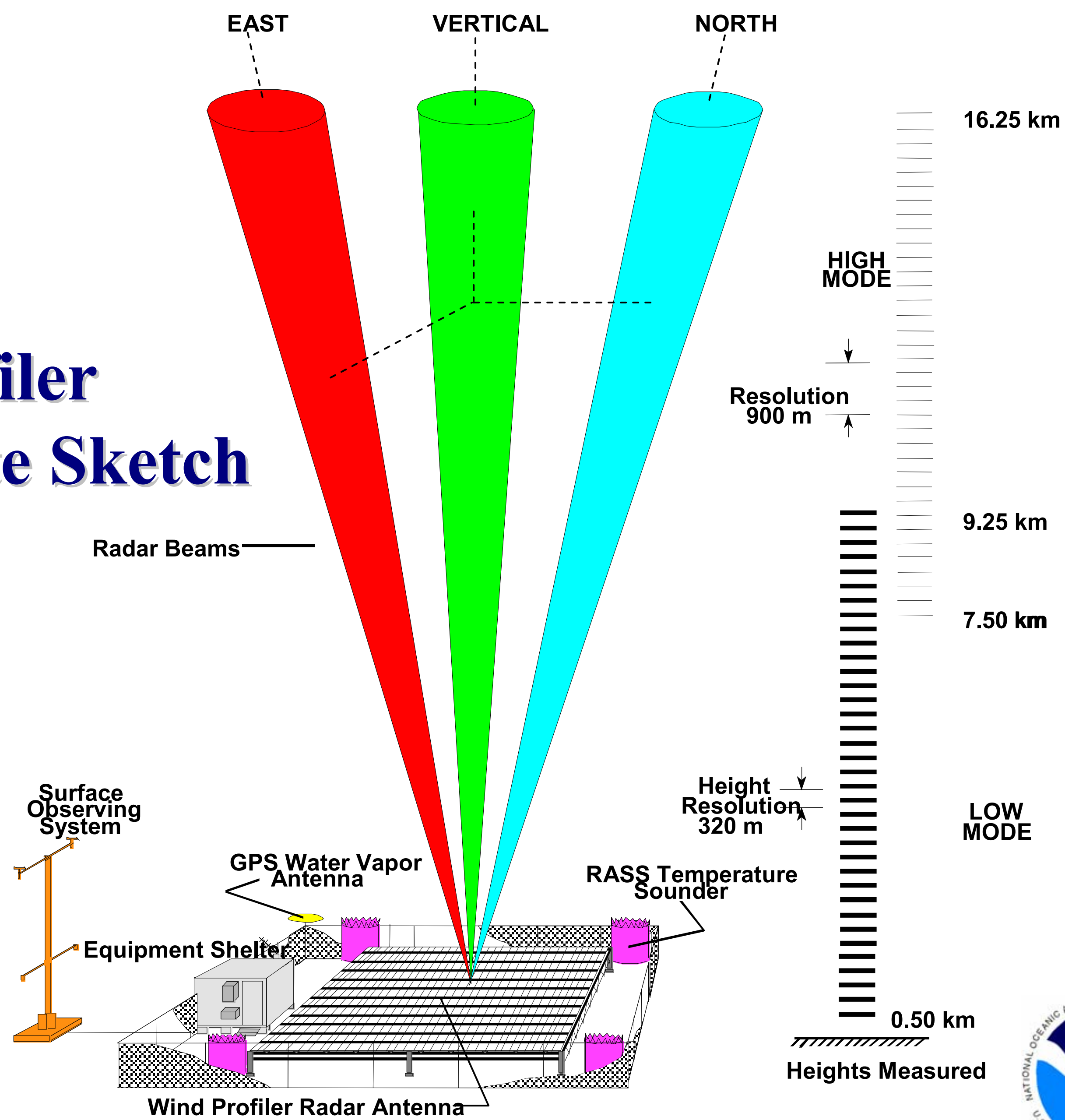
- Norm Abshire
- Mac Carrithers
- Dave Glaze
- Brian Koonsvitsky
- Brian Phillips
- Richard Strauch
- David Wheeler

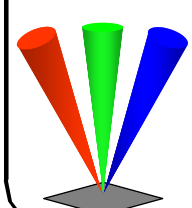
GPS-MET Systems

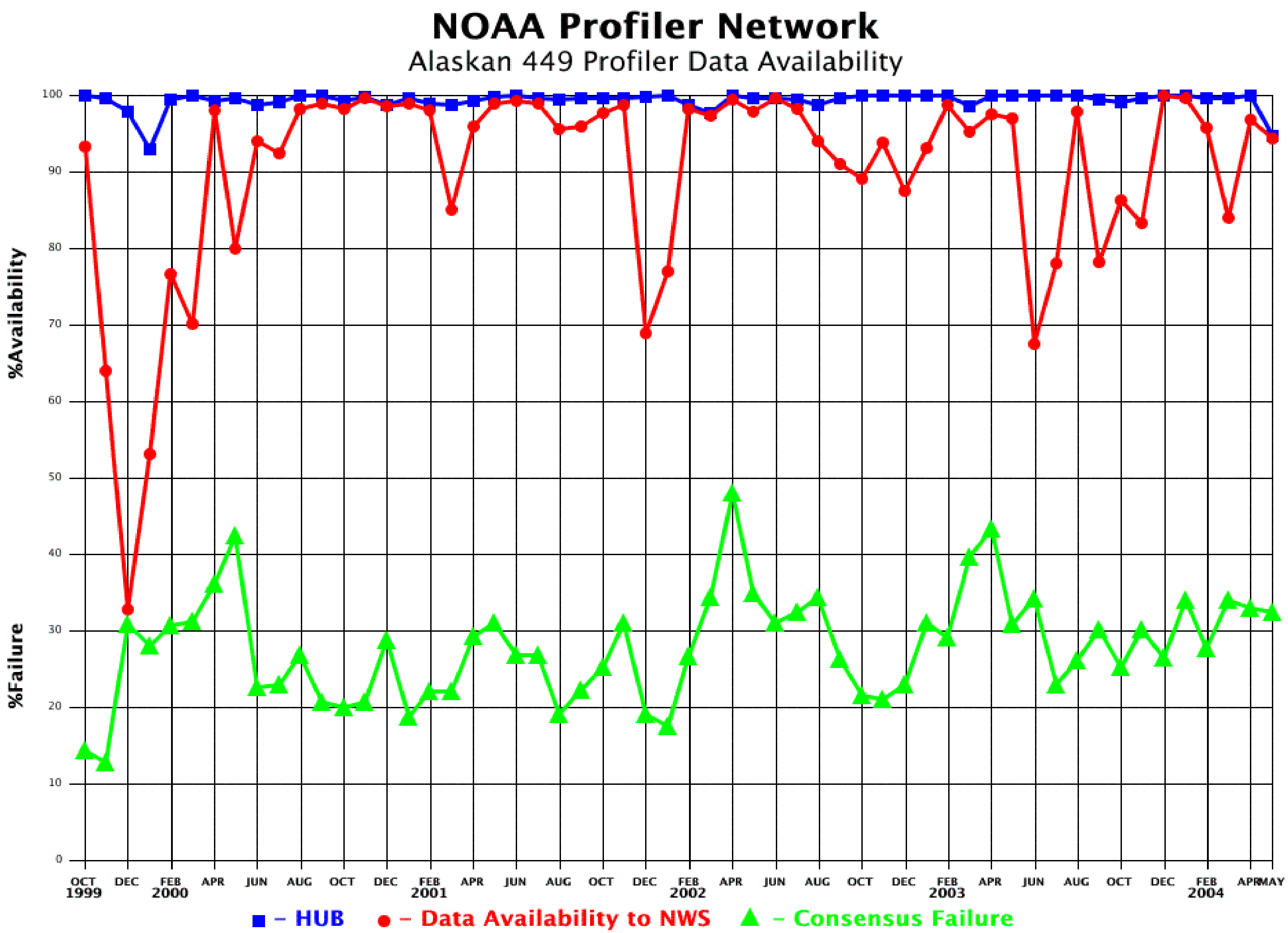
Seth Gutman Chief

- Kirk Holub
- Susan Sahm

NOAA Profiler Network Site Sketch






NOAA Profiler Network
Alaskan 449 Profiler Data Availability
%Availability
%Failure
100
90
80
70
60
50
40
30
20
10
0
OCT 1999
DEC
FEB 2000
APR
JUN
AUG
OCT
DEC
FEB 2001
APR
JUN
AUG
OCT
DEC
FEB 2002
APR
JUN
AUG
OCT
DEC
FEB 2003
APR
JUN
AUG
OCT
DEC
FEB 2004
APR
MAY
■ – HUB
● – Data Availability to NWS
▲ – Consensus Failure

NOAA WIND PROFILER

GUIDE TO LRU REPLACEMENT
For 449 MHz Systems

January 1, 2000

Prepared by
Office of Oceanic and Atmospheric Research
Forecast Systems Laboratory
Profiler Program Office
Boulder, Colorado

Document: 1203-SM-35
Version 5.0

6.6 High Power Amplifier (HPA) Modules

The ten high power amplifier (HPA) assemblies are identical self-contained amplifier modules located inside the power amplifier cabinet assembly mounted to the center module support as shown in Figures 6-31 through 6-33. HPA 1 through HPA 5 are mounted on the left side of the cabinet, and HPA 6 through HPA 10 are mounted on the right side of the cabinet. Figure 6-34 is a drawing of a typical PA module as it would look when removed from the module support bracket.

The typical peak output power of an HPA module assembly is approximately 1.7 KW, each HPA module assembly has internal detector circuitry (see Figure 6-35) that samples the HPAs output power. The SCMI uses this detector identify HPA failures.

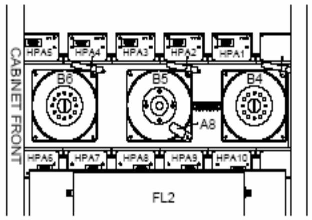


Figure 6-31 HPA Module Location

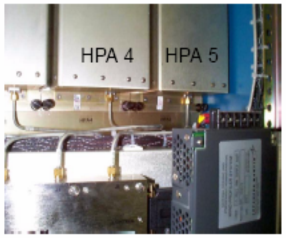


Figure 6-32 Bottom View HPA Module

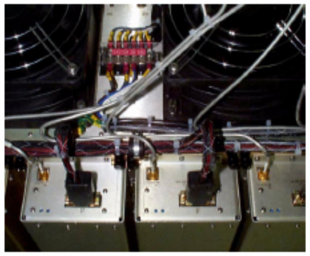


Figure 6-33 Top View of HPA Module

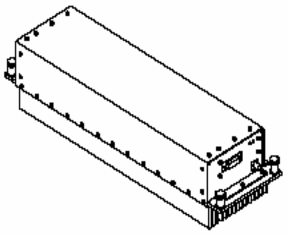
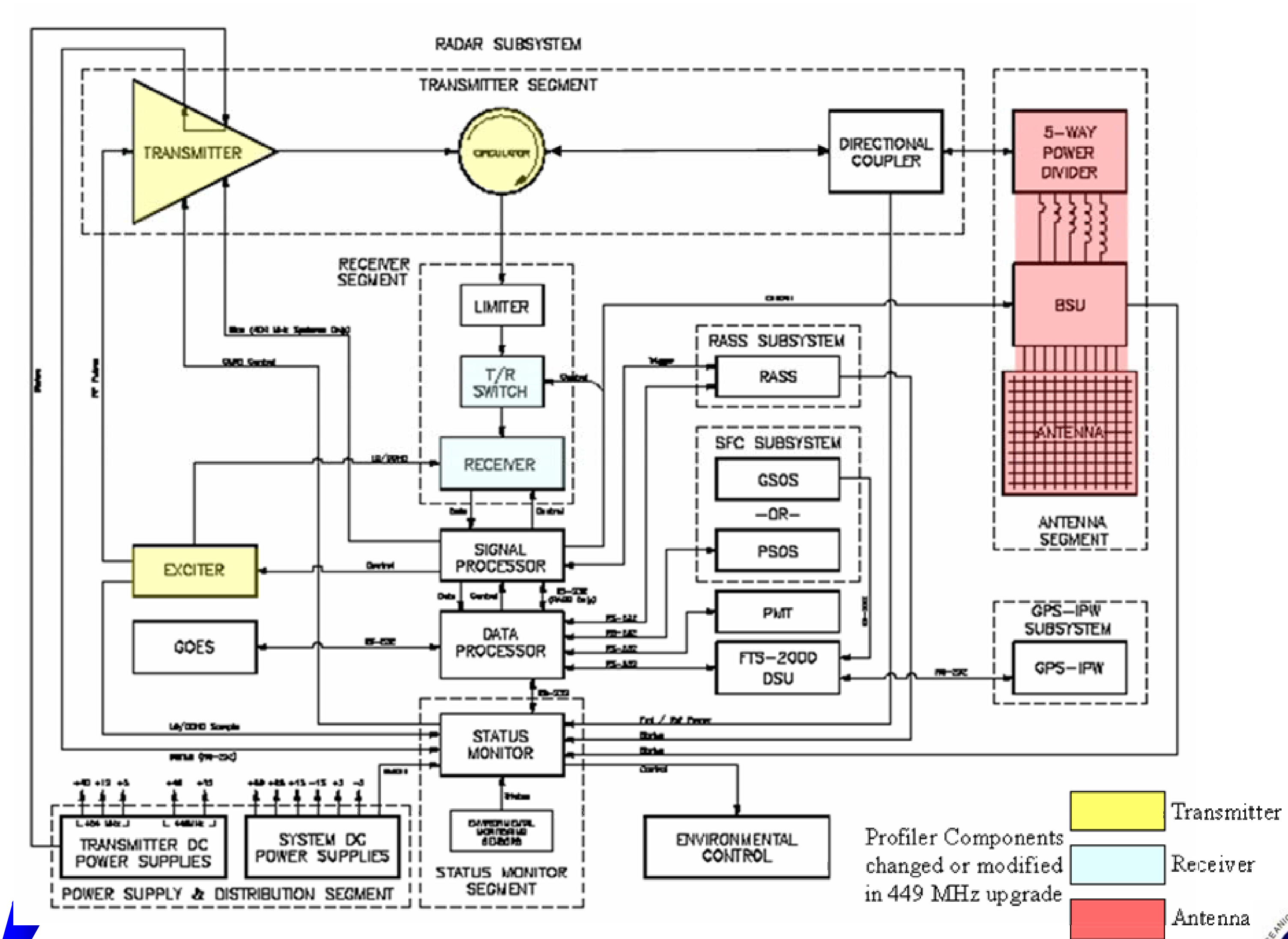
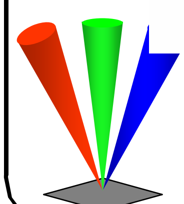


Figure 6-34 Typical HPA Module

Profiler Block Diagram



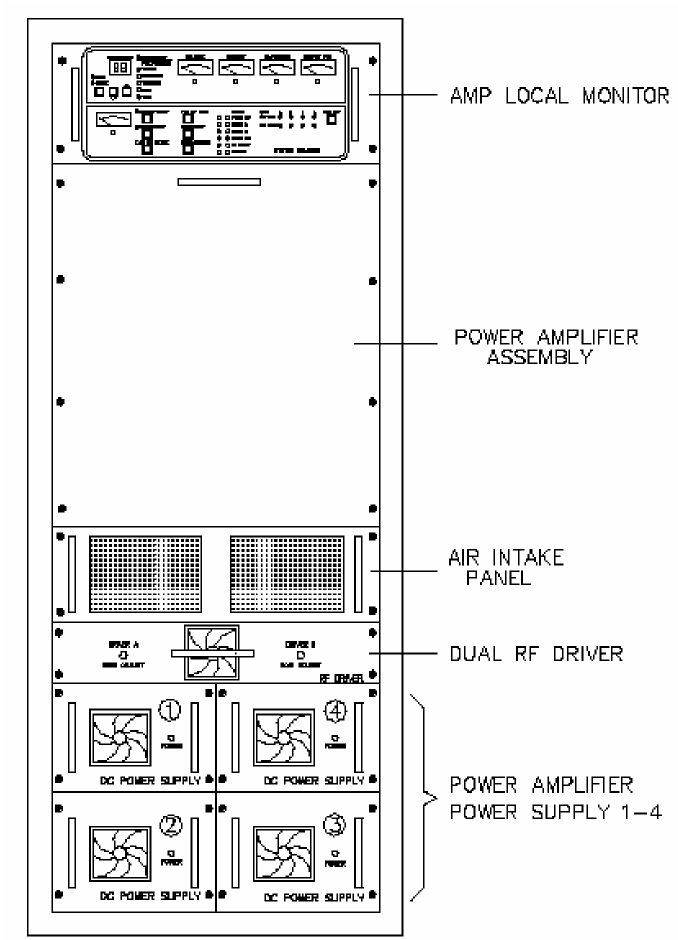


404 MHz Antenna

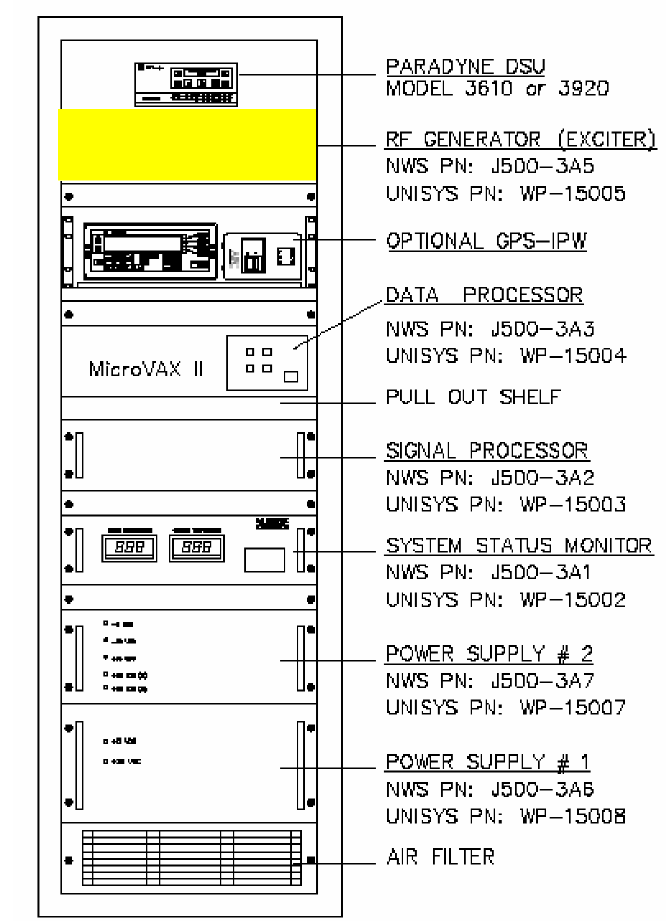
449 MHz Antenna

404 MHz Configuration

Power Amplifier Cabinet

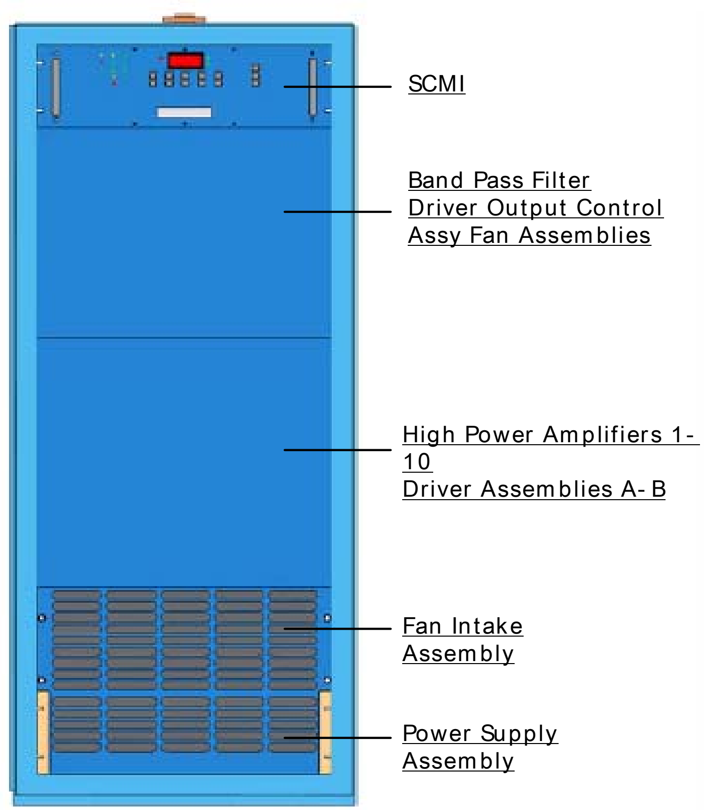


Equipment Cabinet

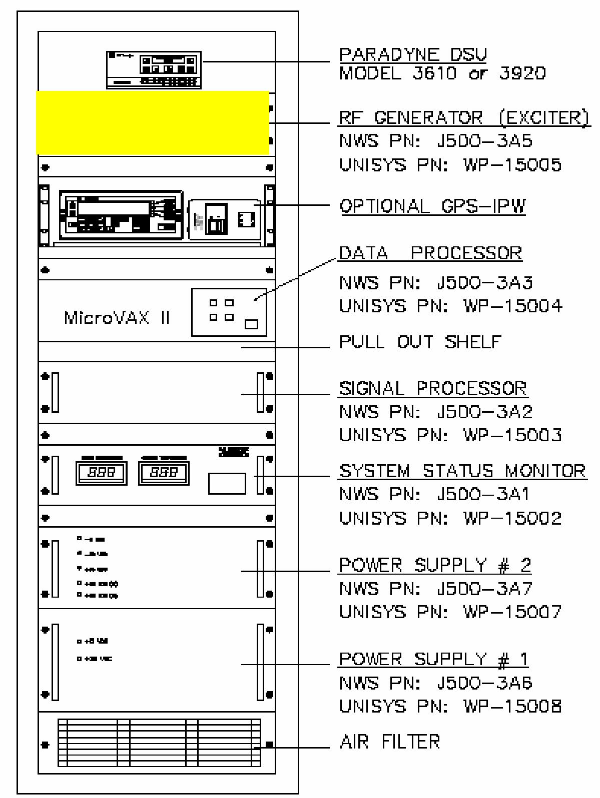


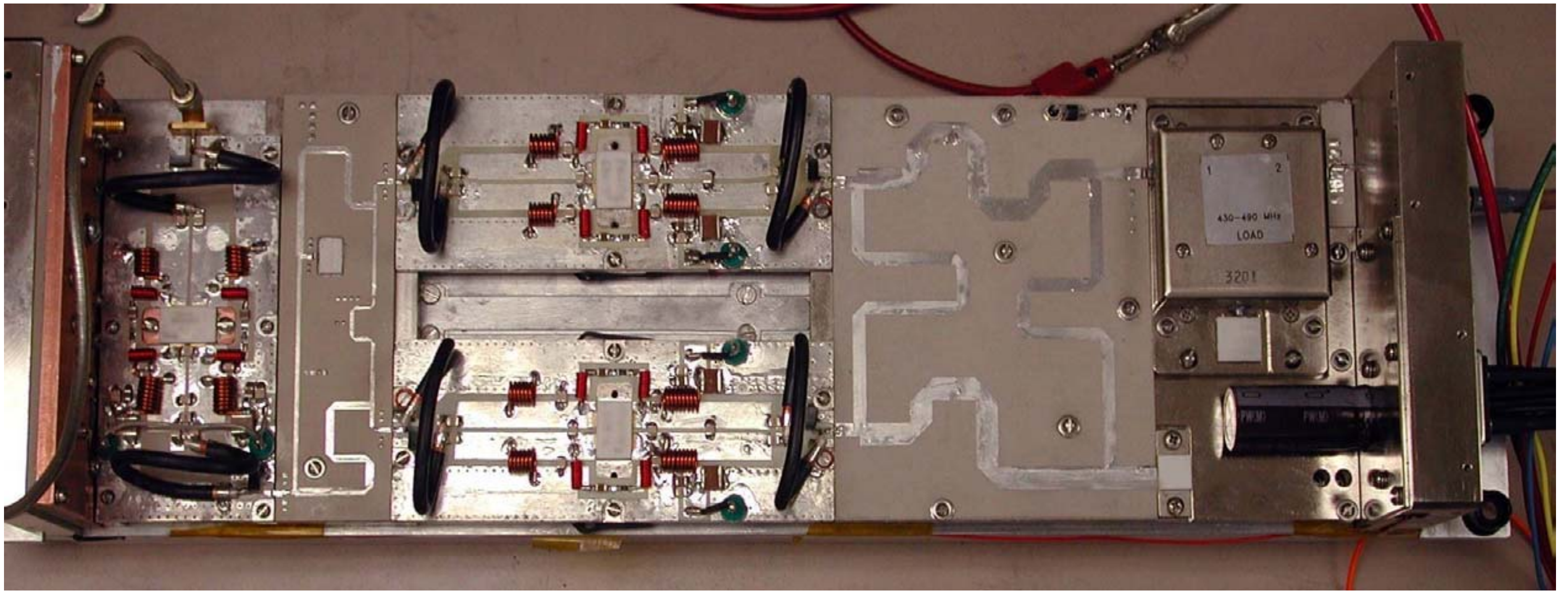
449 MHz Configuration

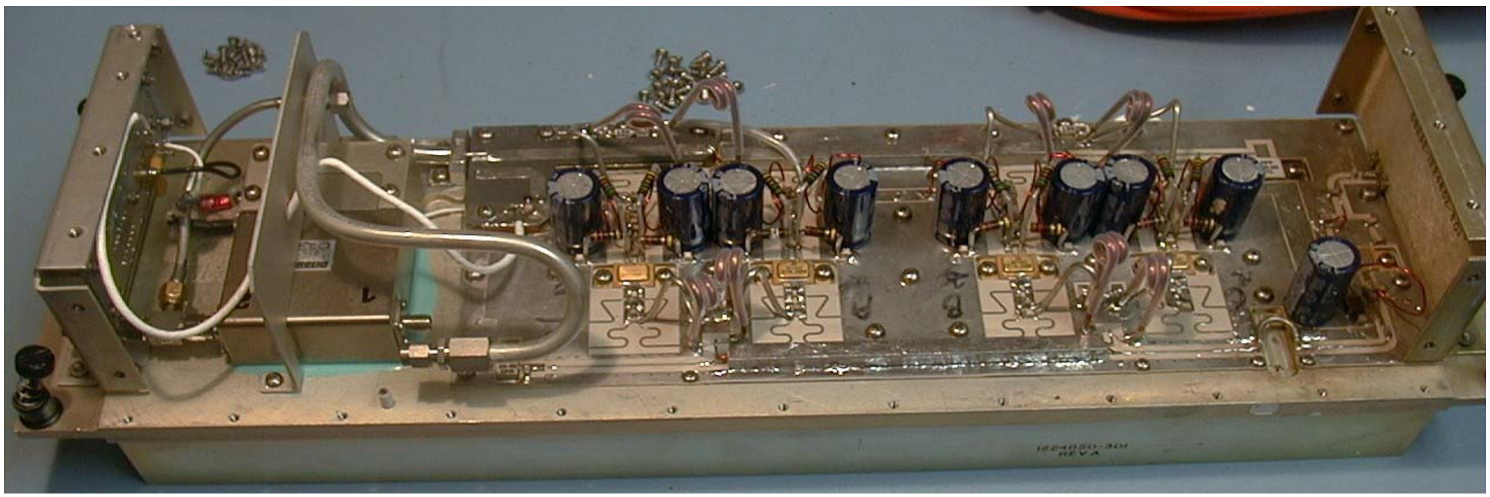
New Power Amplifier Cabinet



Equipment Cabinet w/ Modified RF Generator







449 MHz High Power Amplifiers

NOAA PROFILER NETWORK

TECHNICAL REVIEW

NPN's Future in NWS

Presented by

David R. Helms

June 22, 2004

NOAA Profiler Network

Future in NWS

Briefing for 2004 NPN Tech Review

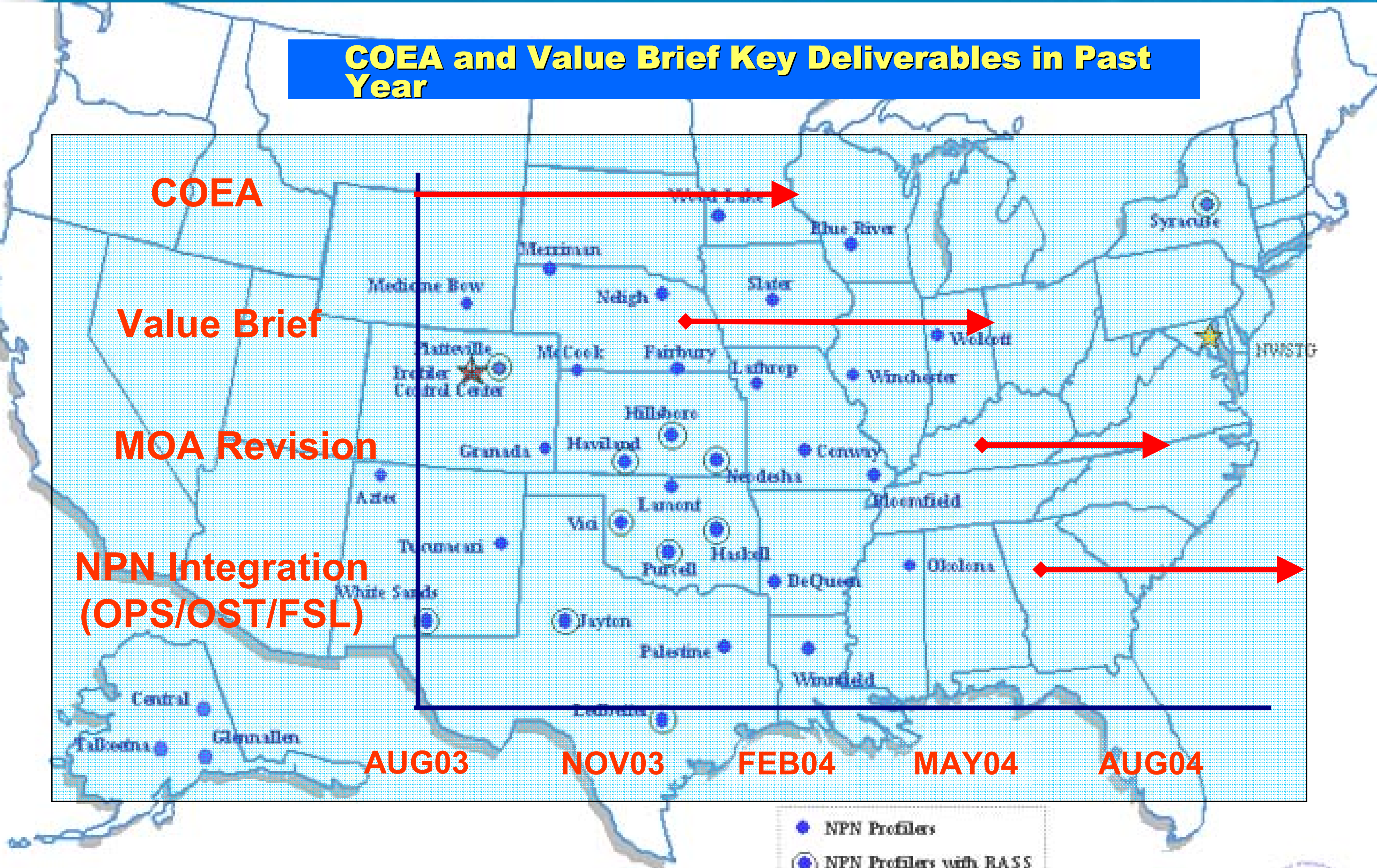
David R. Helms

June 22, 2004

Outline

- Background
- Value Brief
- Near-Term Challenges
- Long-Term Challenges
- Towards An Integrated Upper Air Observing System
- Funding Issues
- Roadmap

COEA and Value Brief Key Deliverables in Past Year



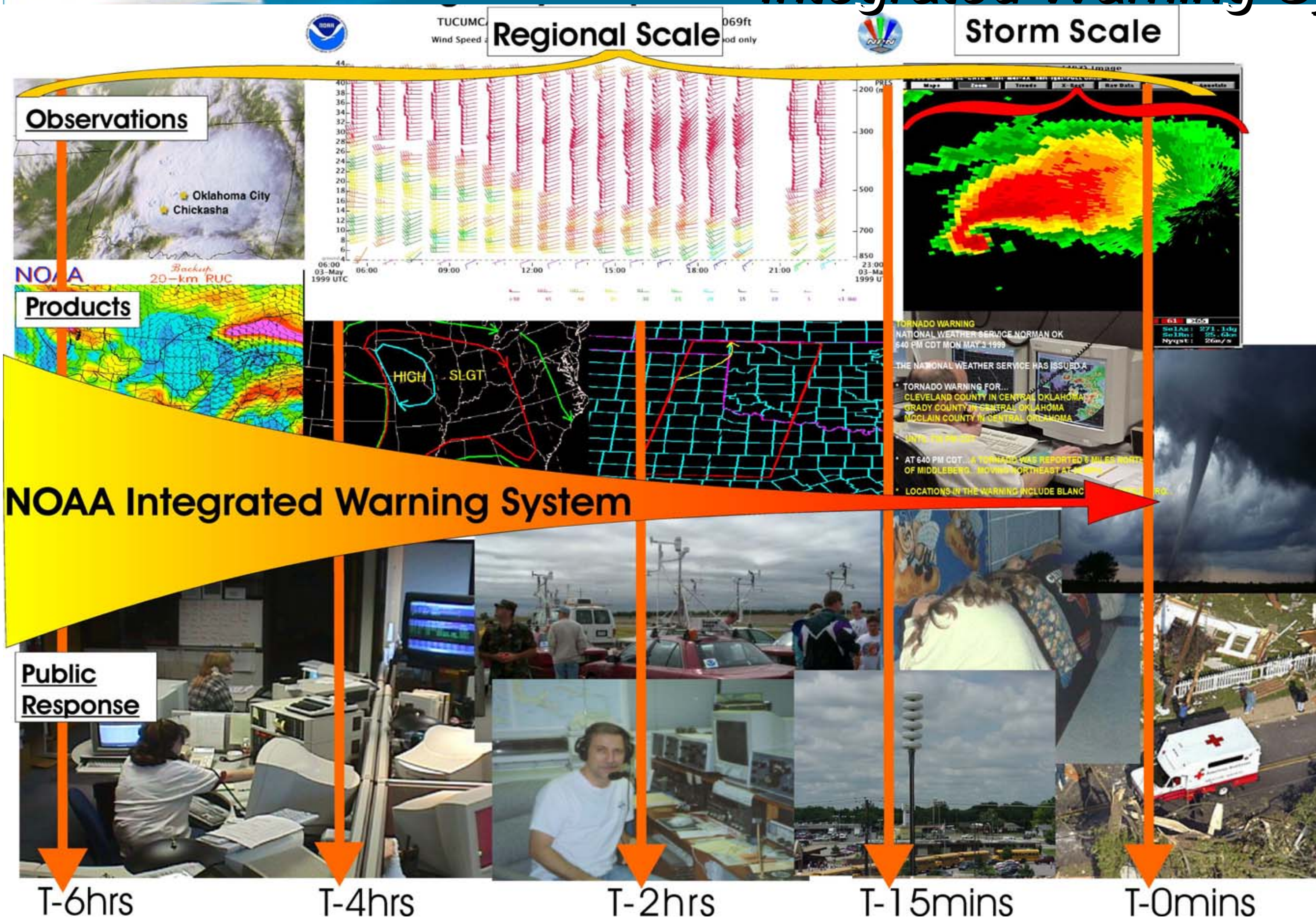
Value Brief

Questions Addressed

- What role does the NPN play in supporting NOAA Services?
- How are NPN winds used in operations?
- What are benefits of NPN wind observations?
- Is NPN a cost-effective solution?

Value Brief

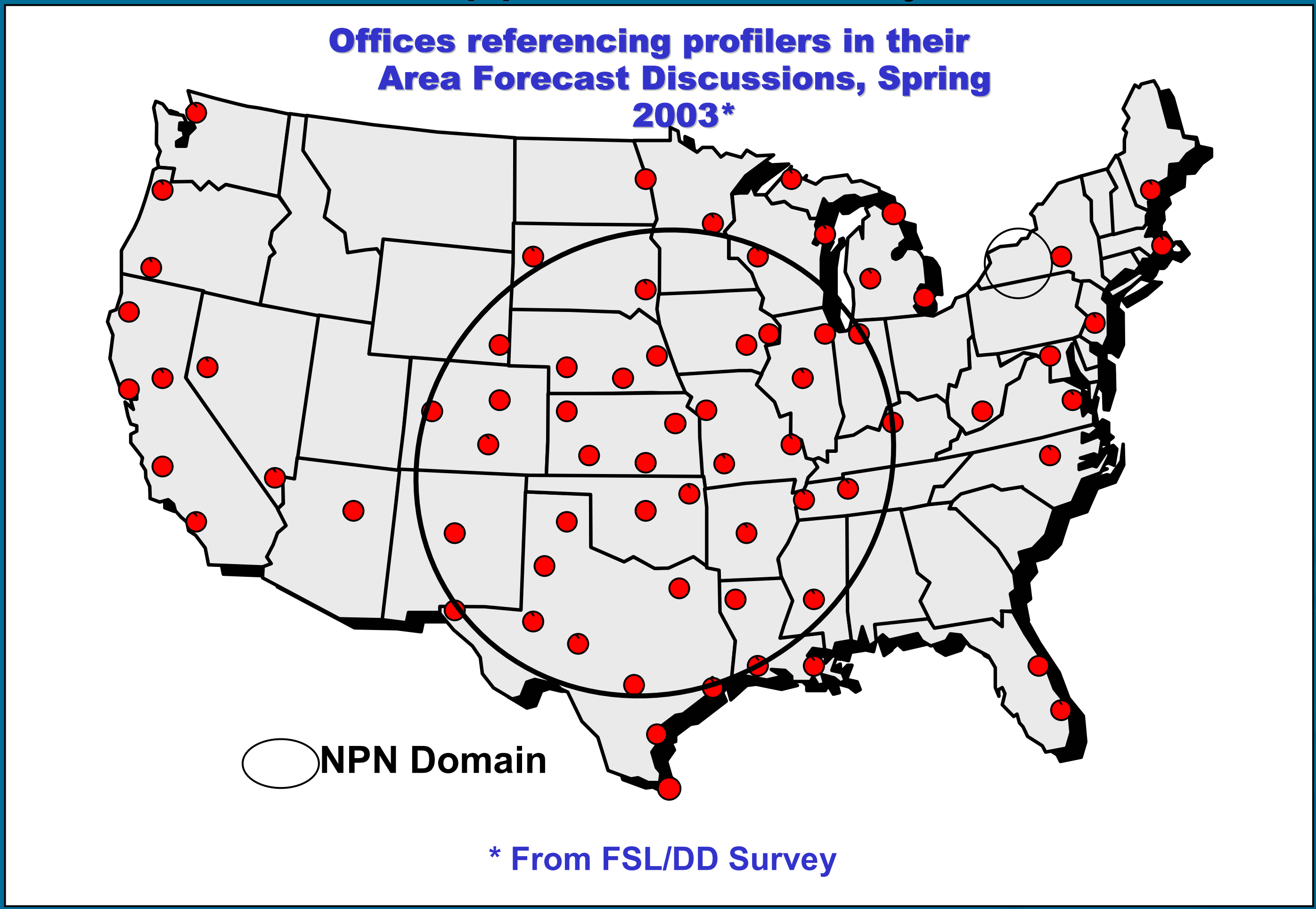
NPN a Component of NOAA's Integrated Warning System



Value Brief

Use in Operations

Wind Profiler observations used by at least 70 Weather Forecast Offices in support of a variety of missions



Value Brief

Forecasts and Warnings

- High space- and time-resolution NPN wind measurements improve *warnings*, *watches*, and *numerical forecasts*:
  - *Warnings: Statistical improvements in POD, FAR, and Lead Time performance for tornadoes and flash floods*

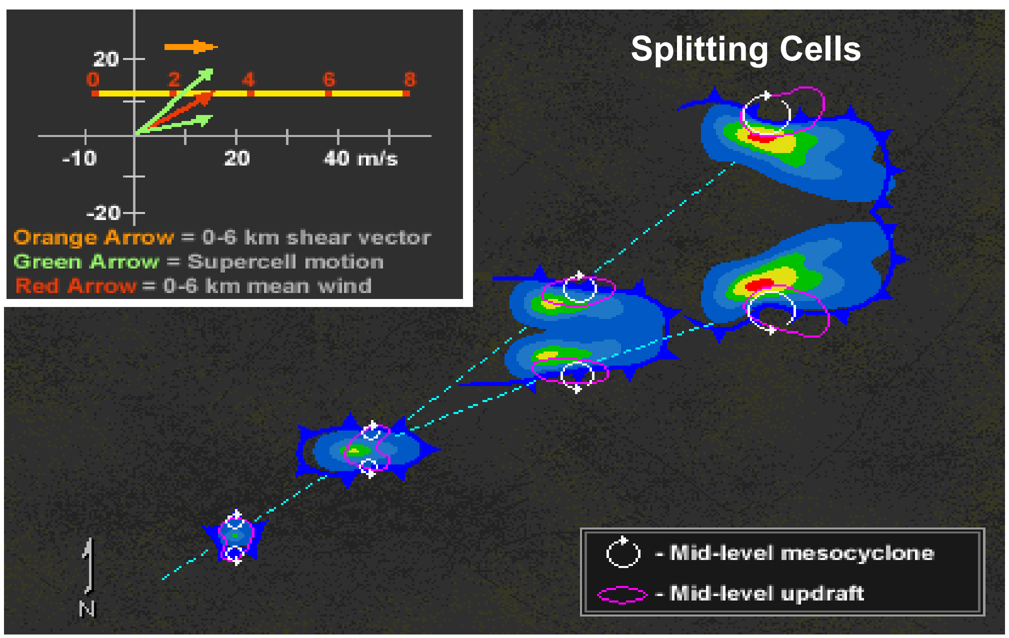
    Lead time improvements in representative winter storm, fire weather, and turbulence warning events
  - *Watches and Outlooks: Statistical improvements in severe weather watch and outlook accuracy*
  - *Numerical Weather Prediction: Statistical improvements in 0-12 h forecasts*

Value Brief

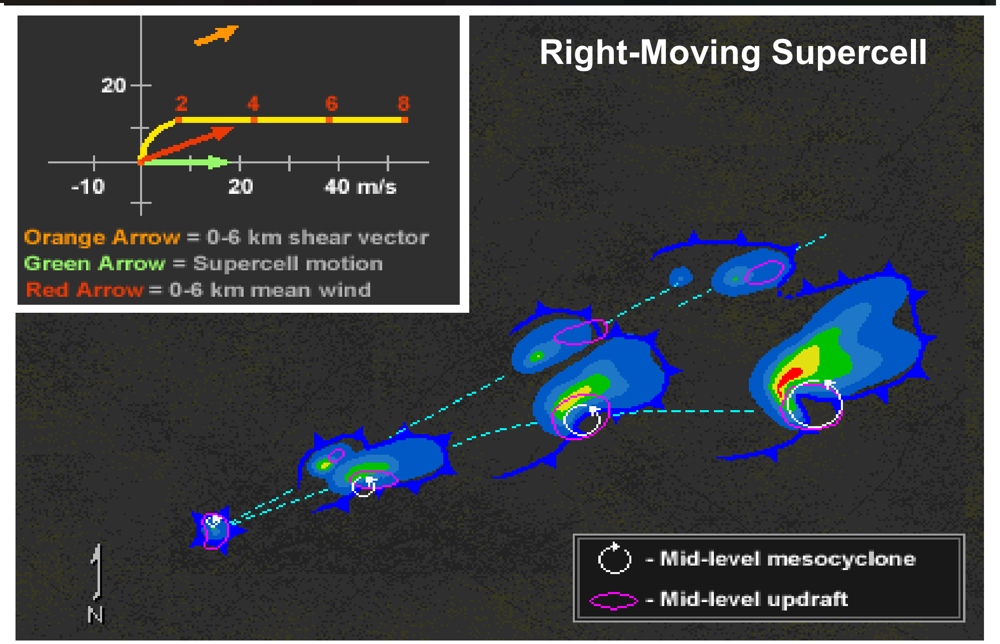
Use of Conceptual Models

Vertical wind shear has a controlling influence on the form and evolution of individual convective storms -

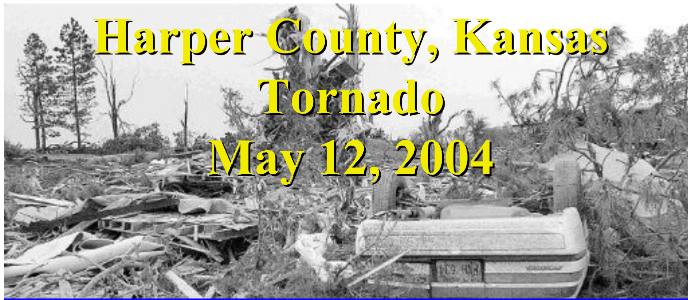
Knowing the vertical wind shear allows meteorologists to *anticipate* thunderstorm behavior



Weisman and Klemp, Ray, Ed., 1986 / The COMET Program



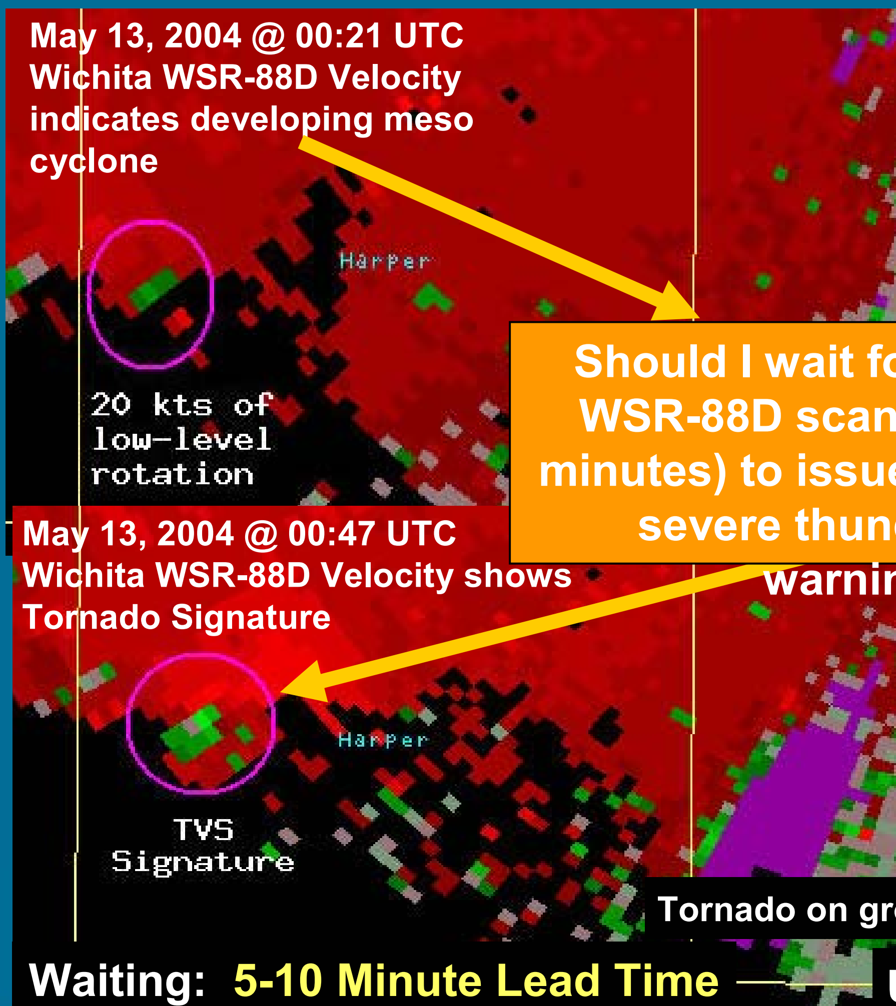
Weisman and Klemp, Ray, Ed., 1986 / The COMET Program



Value Brief

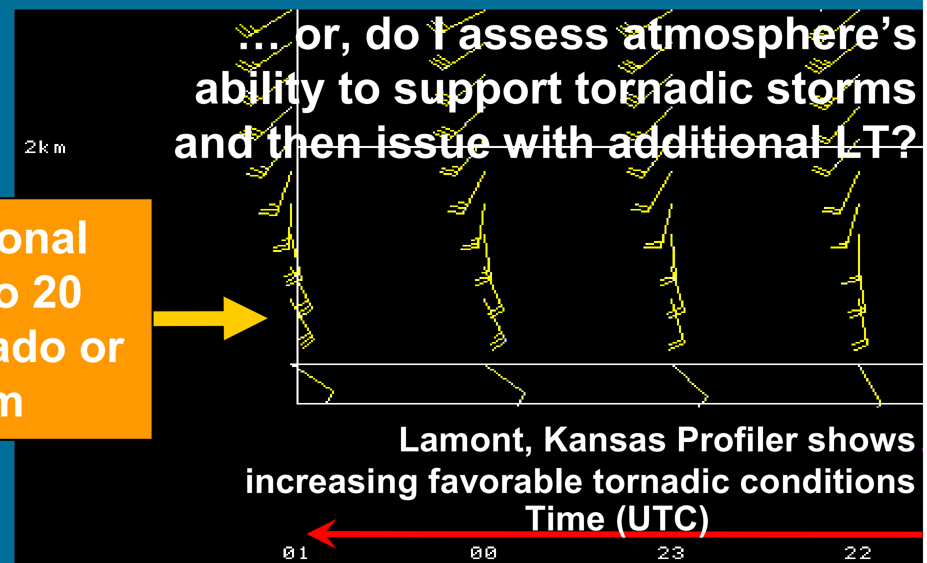
How WFOs use Profiler Data in Tornadic Situations

"At least six tornadoes touched down in central and southern Kansas, including one that just missed the town of Attica in Harper County. No fatalities or injuries are reported." ---Wichita Eagle, May 13, 2004



Should I wait for additional WSR-88D scans (+10 to 20 minutes) to issue a tornado or severe thunderstorm warning?

… or, do I assess atmosphere's ability to support tornadic storms and then issue with additional LT?



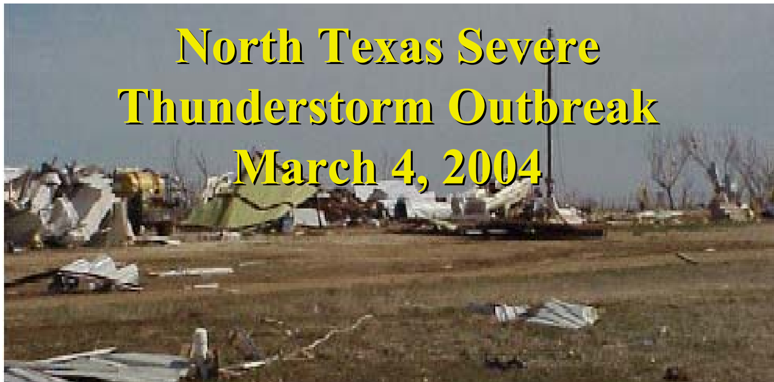
Lamont, Kansas Profiler shows increasing favorable tornadic conditions

Using profiler network to improve situational awareness enabled WFO Wichita to issue a tornado warning 16-21 minutes *before* radar indicated tornado signature

Tornado on ground 00:53 UTC

Waiting: 5-10 Minute Lead Time

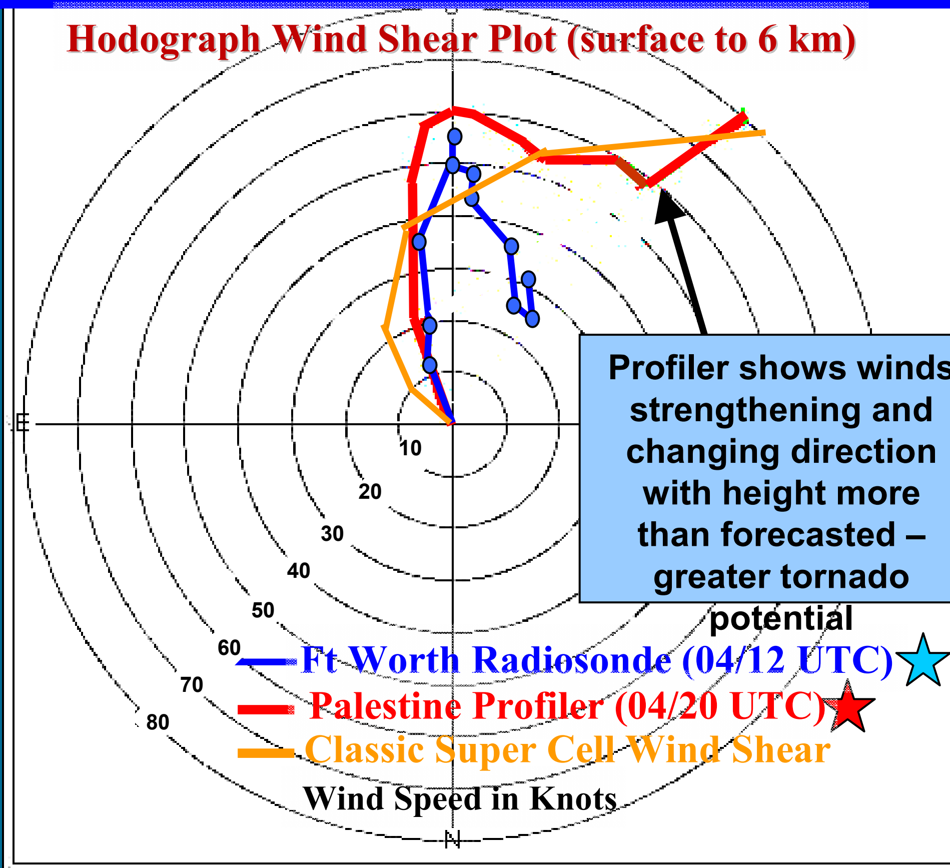
Use Situational Awareness: 26 Minutes Lead Time

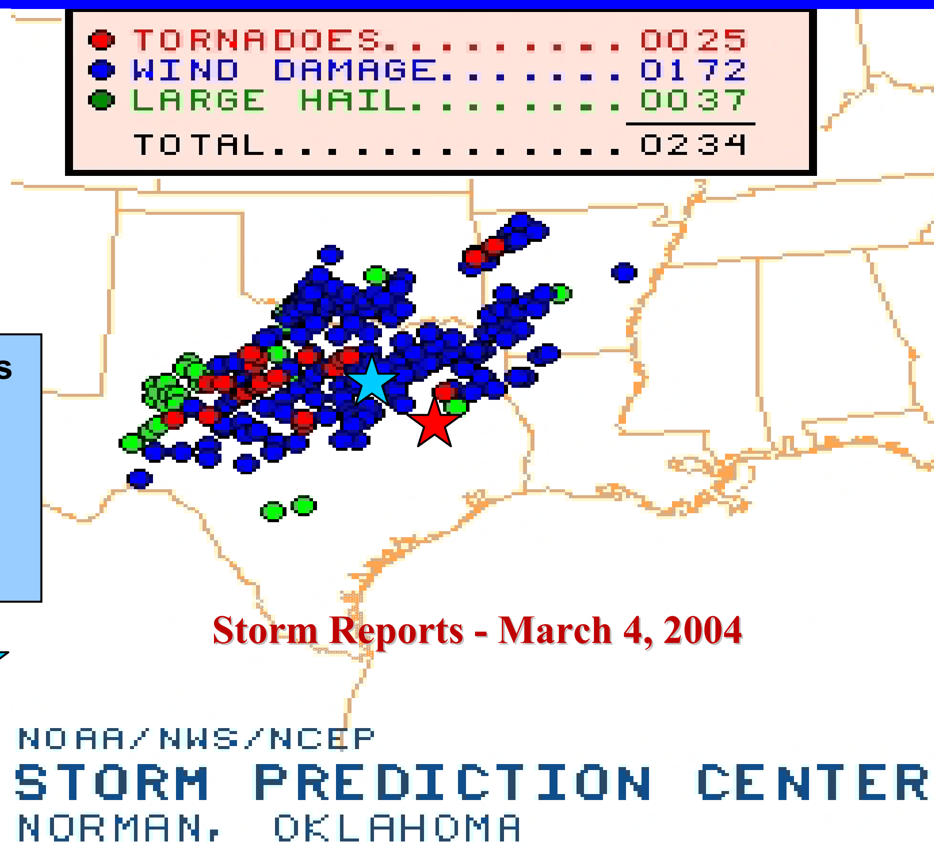


Value Brief

How WFOs use Profiler Data in Tornadic Situations

"…BEFORE outbreak started. Observed wind fields from NPN helped our forecasters become fully aware of severe weather potential…. Once we noticed that convection had developed and was moving east, our briefings to Emergency Managers reflected proper threat level …"



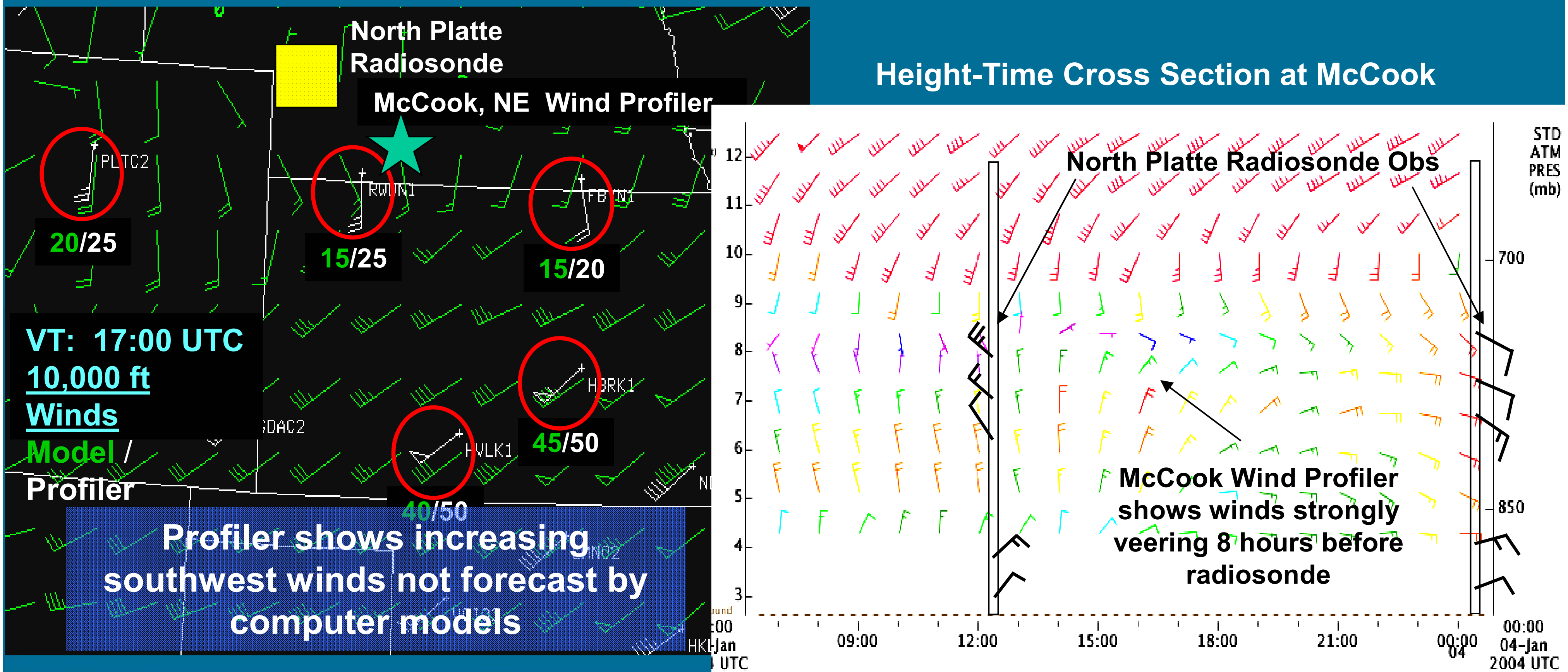


WFO Hastings, Nebraska Heavy Snow Warning, January 3-4, 2004

Value Brief

How WFOs use Profiler Data in Winter Storm Situations

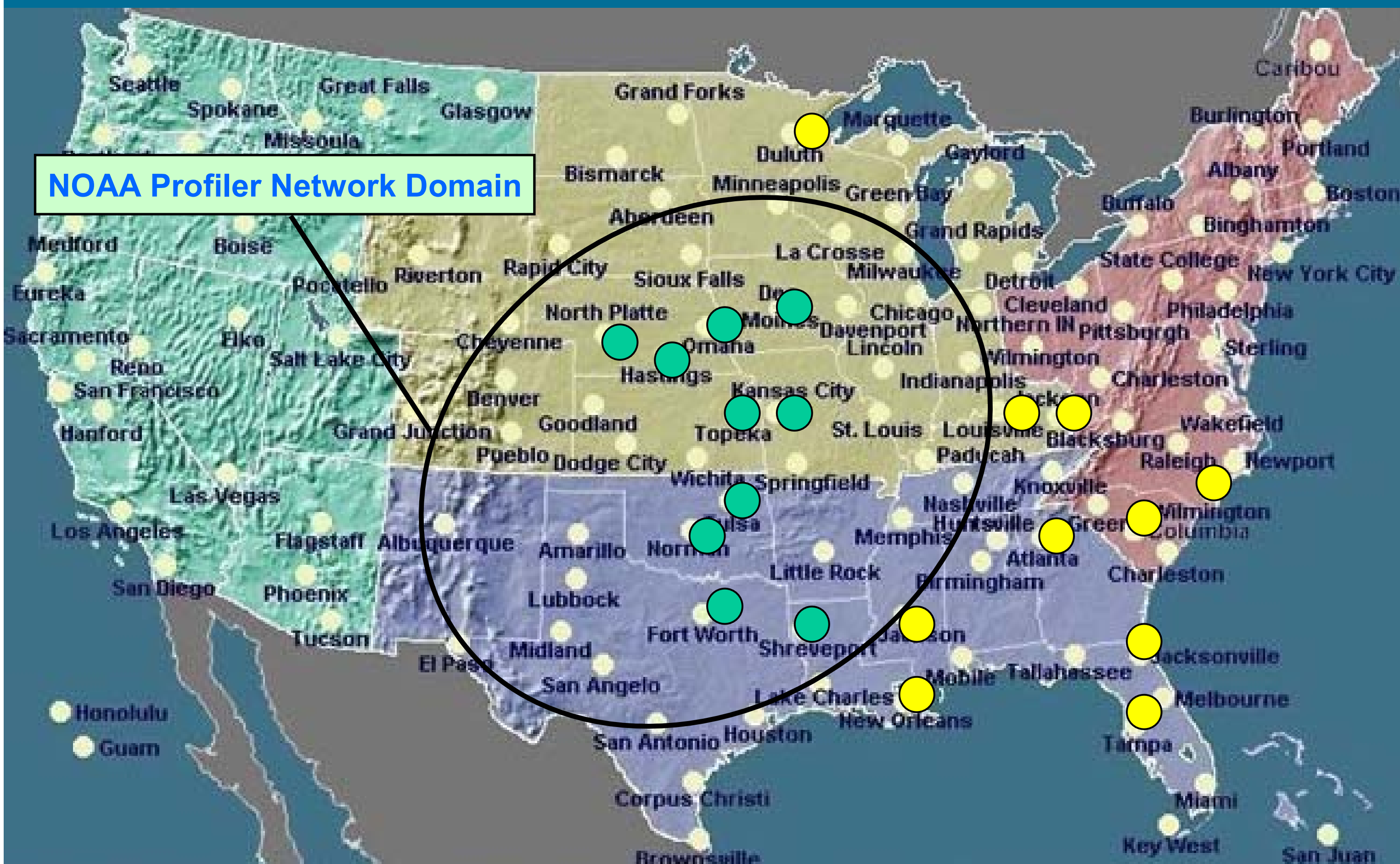
"Winter weather advisory upgraded… to a winter storm warning based, on part, on signatures seen on the wind profiler"



Value Brief

Warning Performance - Tornadoes

Quantify benefits by comparing tornado warning performance statistics for 10 WFOs within network and 10 WFOs outside network



WFO Inside Network

WFO Outside Network

All experience high tornado frequencies

Data: 1999-2003

Value Brief

Performance – Tornado Warnings

Results: Tornado warning statistics better within NPN network

Impact of NPN Data on Warning Performance
Statistics: 1999-2003 Average (10 WFOs each Category)

	WFOs within NPN	WFOs Outside NPN	% Difference
Probability of Detection	0.79	0.62	+27
False Alarm Rate	0.68	0.85	-20
Critical Success Index	0.29	0.14	+107
Lead Time	12.9	9.5	+36

Increased situational awareness from wind profiler data *improves* tornado lead time, detection, and false alarm performance measures

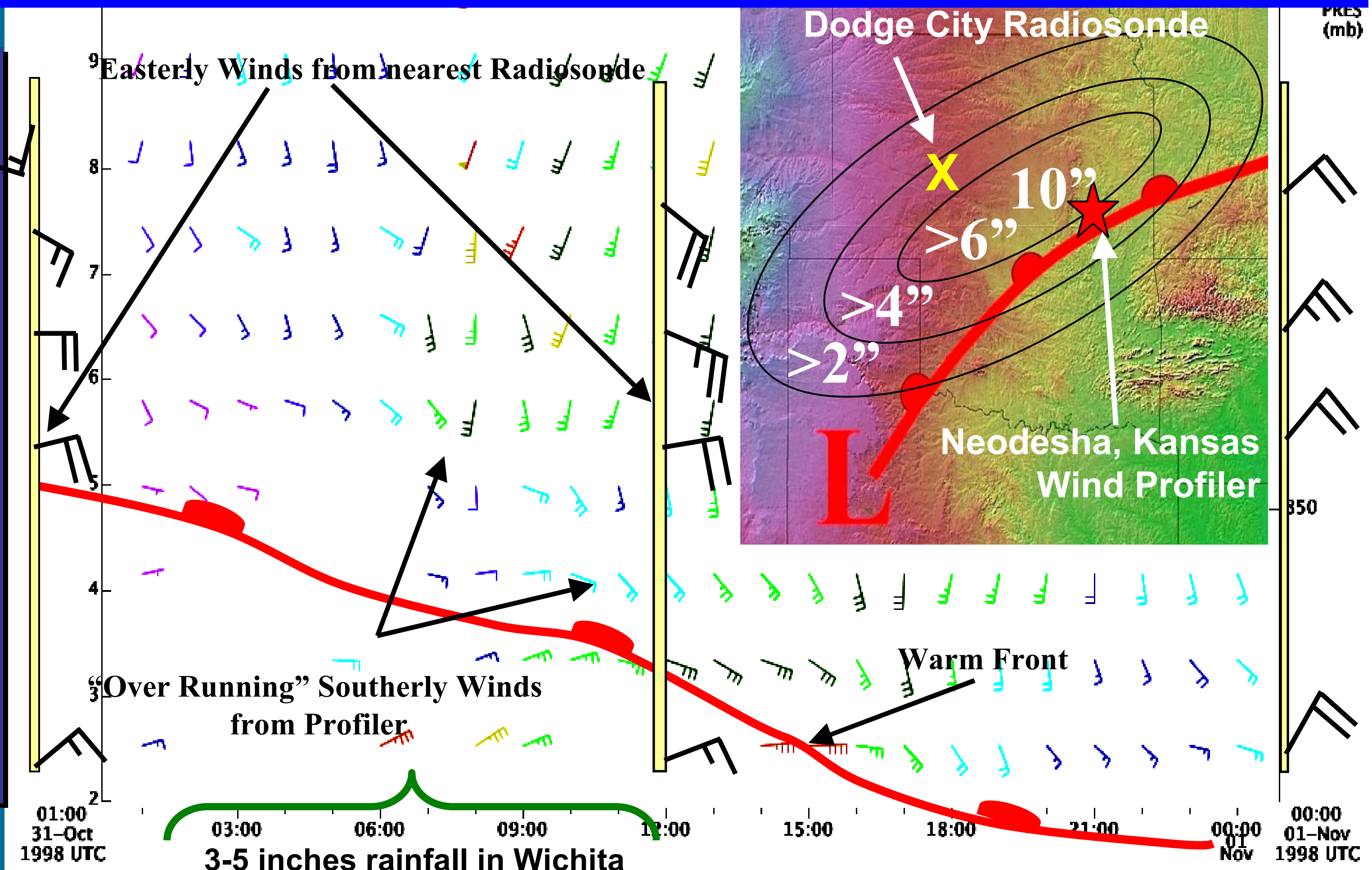
Warning Event Simulation Experiment

Value Brief

How WFOs use Profiler Data in Flash Flood Situations

As a result of accurate forecasts of rainfall and a record flood, law enforcement and emergency preparedness officials had ample lead time to commence evacuation procedures

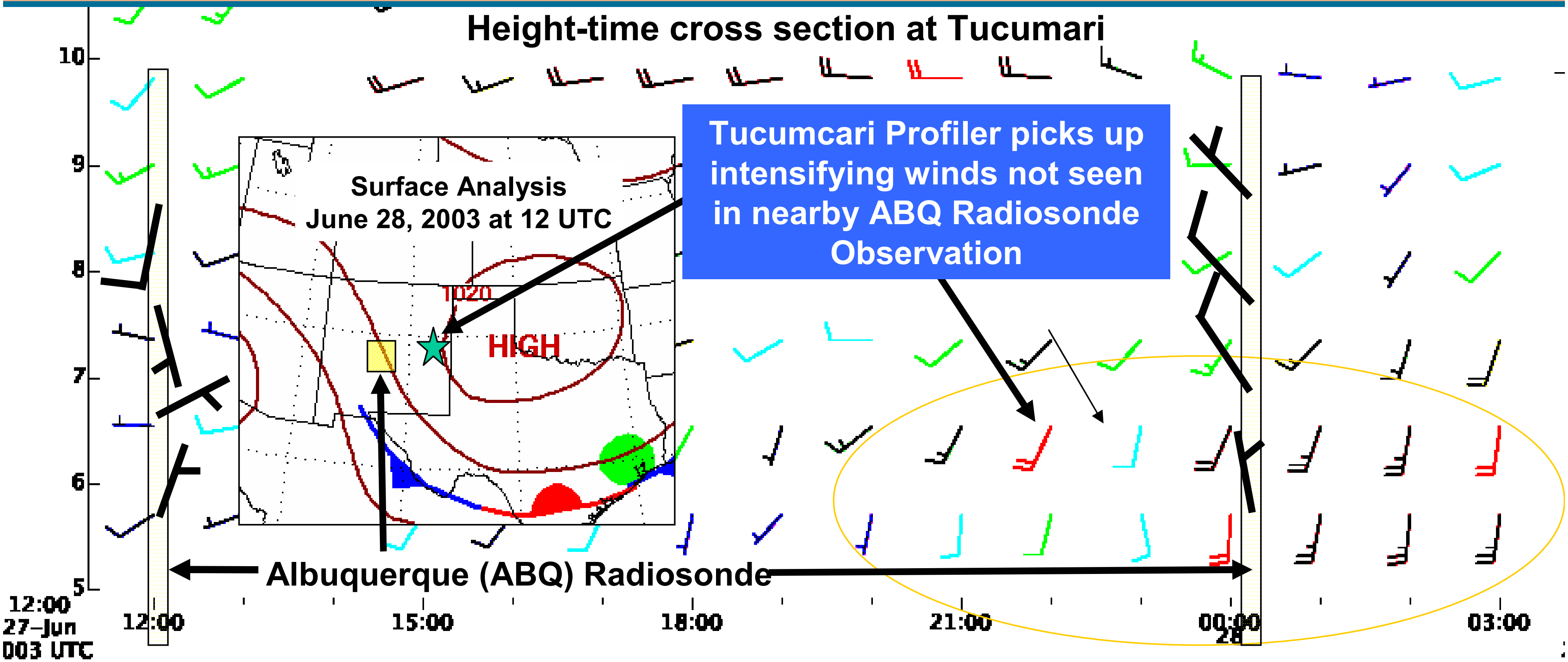
- Profiler shows southerly winds conducive for heavy rainfall over 24-hour period
- Nearest radiosonde winds remain easterly – not as conducive



Value Brief

How WFOs use Profiler Data in Fire Weather Situations

"Firefighters were ready when wind shifted -- no homes burned in the nearby neighborhoods"



"Forecasters at NWS office in Albuquerque used Tucumcari wind profiler data to inform fire management crew that abrupt increase in low-level wind would occur shortly before midnight."

Value Brief

Projected Benefits of a National Network

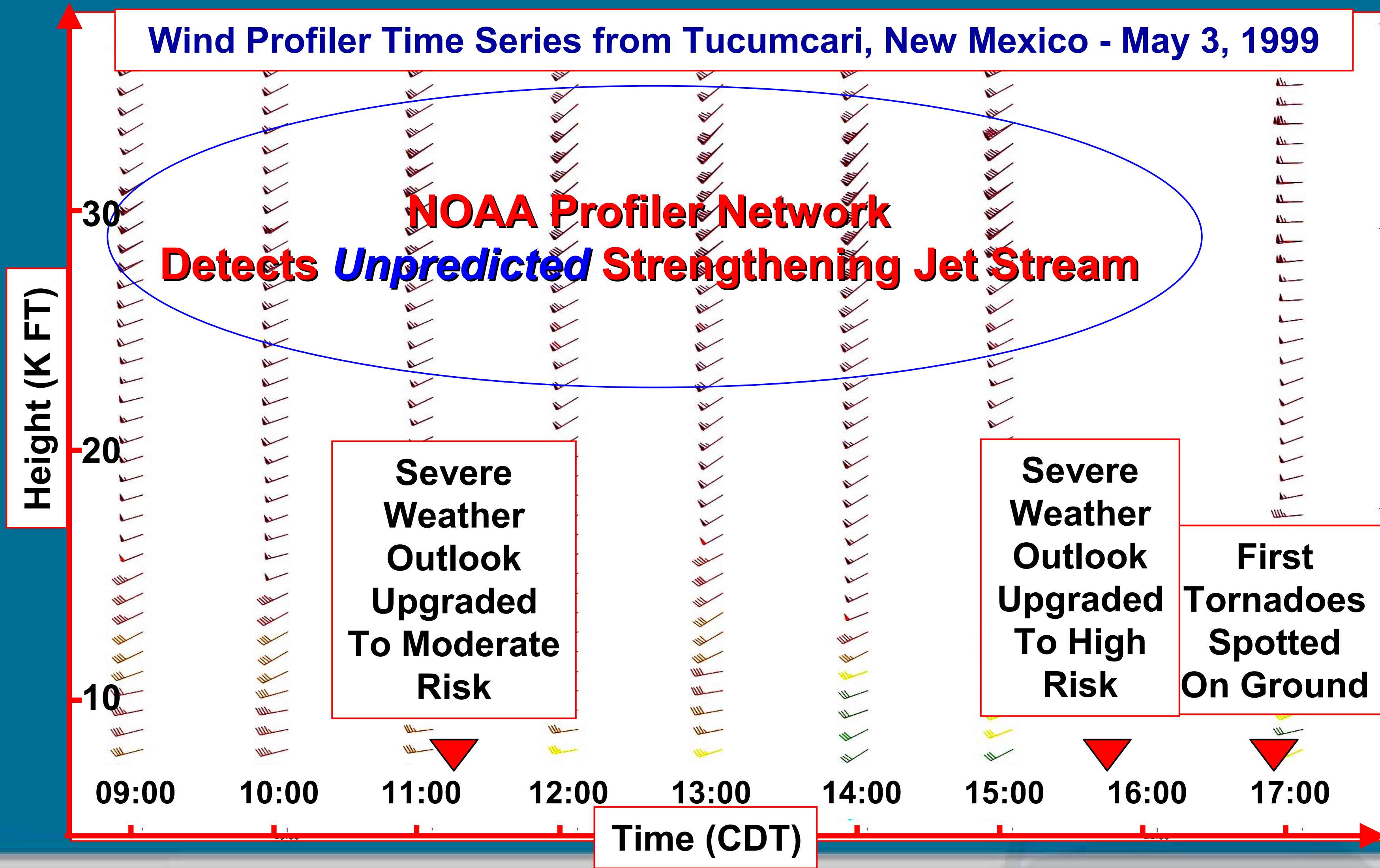
Warning Lead Time Improvements:

	Improvement	Baseline LT	With National Network
Tornado	+1.2 mins	11.5 mins	12.7 mins
Flash Flood	+3.1 mins	46.4 mins	49.5 mins
Winter Storms	+0.3 hours	13.0 hours	13.3 hours
Red Flag Warnings	+2.3 hours	8.7 hours	11.0 hours

Value Brief

How SPC uses Profiler Data in Convective Situations

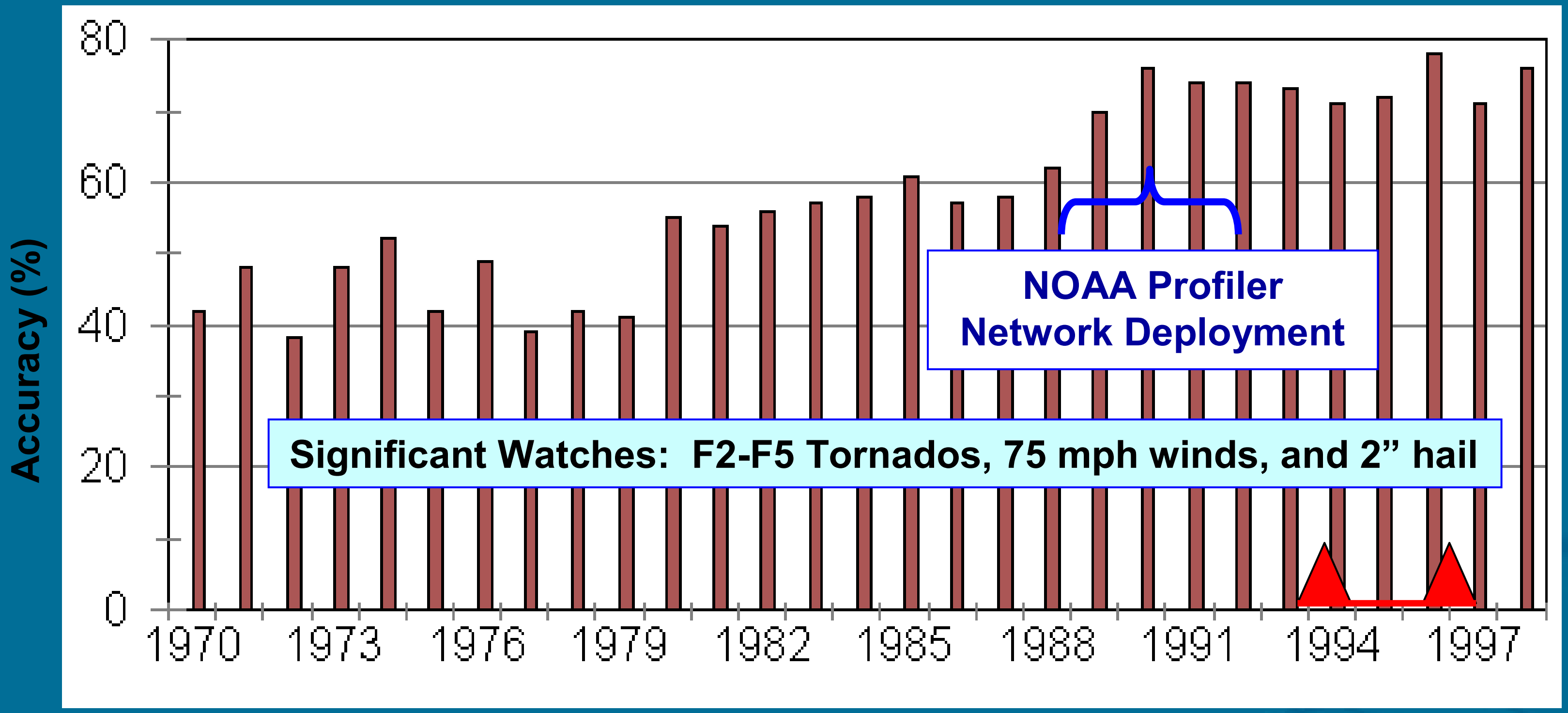
SPC upgrades severe weather risk in Oklahoma to “high” based on profiler winds



Value Brief

Performance

Results: SPC National Watch Accuracy for F2-F5 Tornadoes Improved *15%* with NPN Deployment



Deployment and Commissioning of WSR-88D system

NPN vertical wind shear data used to monitor rapidly changing conditions to assess *risk and type* of severe thunderstorms.

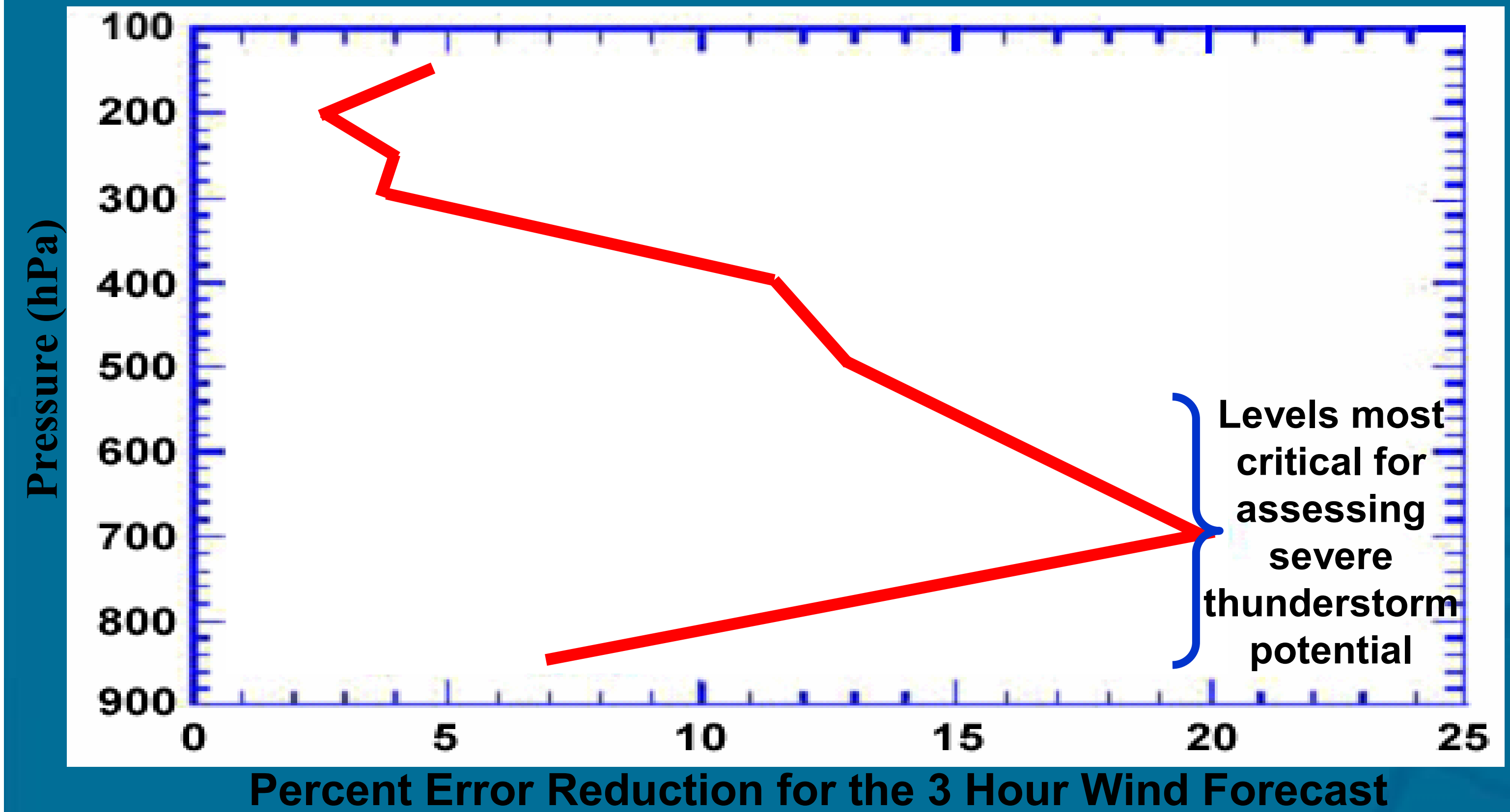
Value Brief

Projected Benefits of a National Network

Watches and Outlooks: Improve (F2+) tornado watch accuracy *by 13%* East of the Rocky Mountains from 62% to 75% POD

Value Brief
Performance

Results: Adding NPN wind data improves short-term (<12 hr) model forecast accuracy by *as much as 20%.*



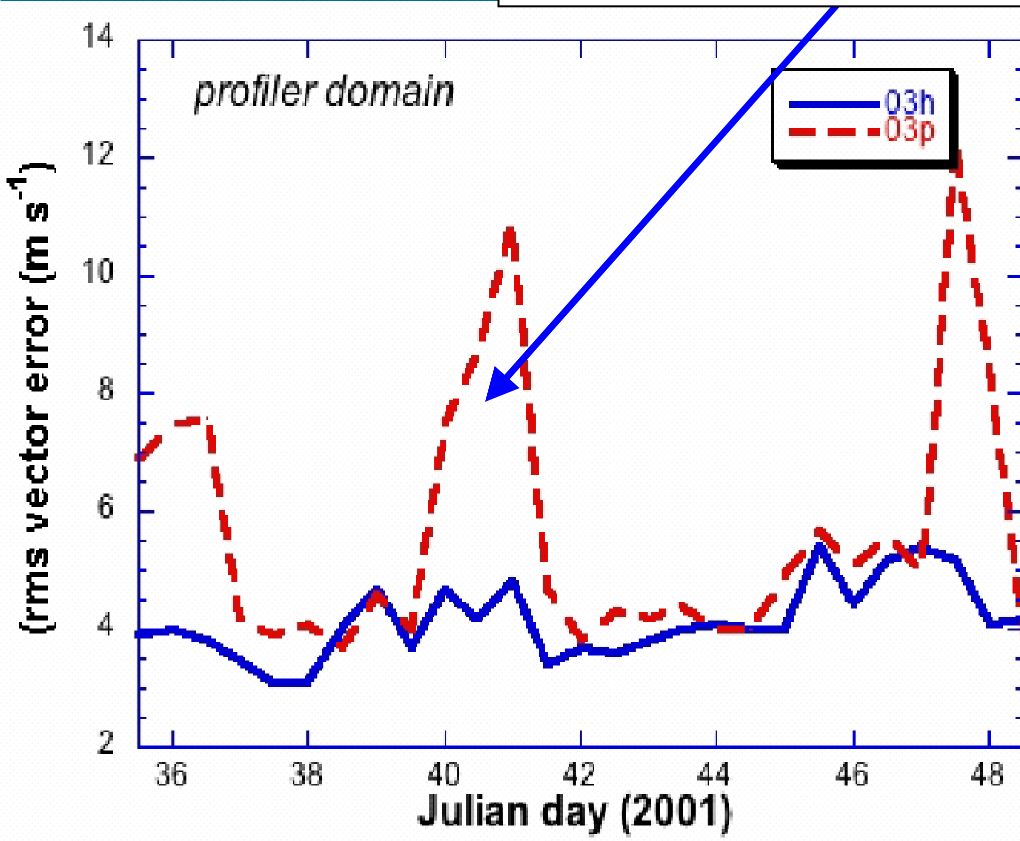
Improvements

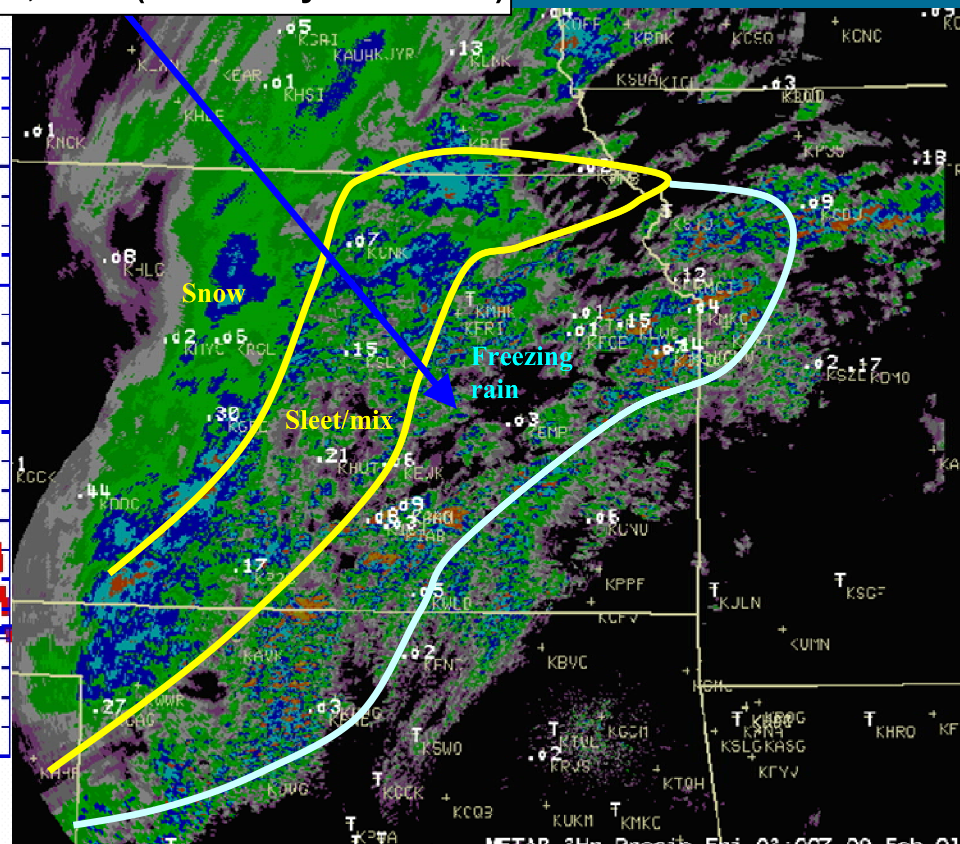
- Avg = +0.5 to 1.0 m/s
- Max = +13 m/s

Value Brief
Performance

Eta Data Denial Experiment: Model Error at 500 hPa 4-17 February 2001

Major Winter Storm - February 9, 2001 (Julian Day of Year 40)



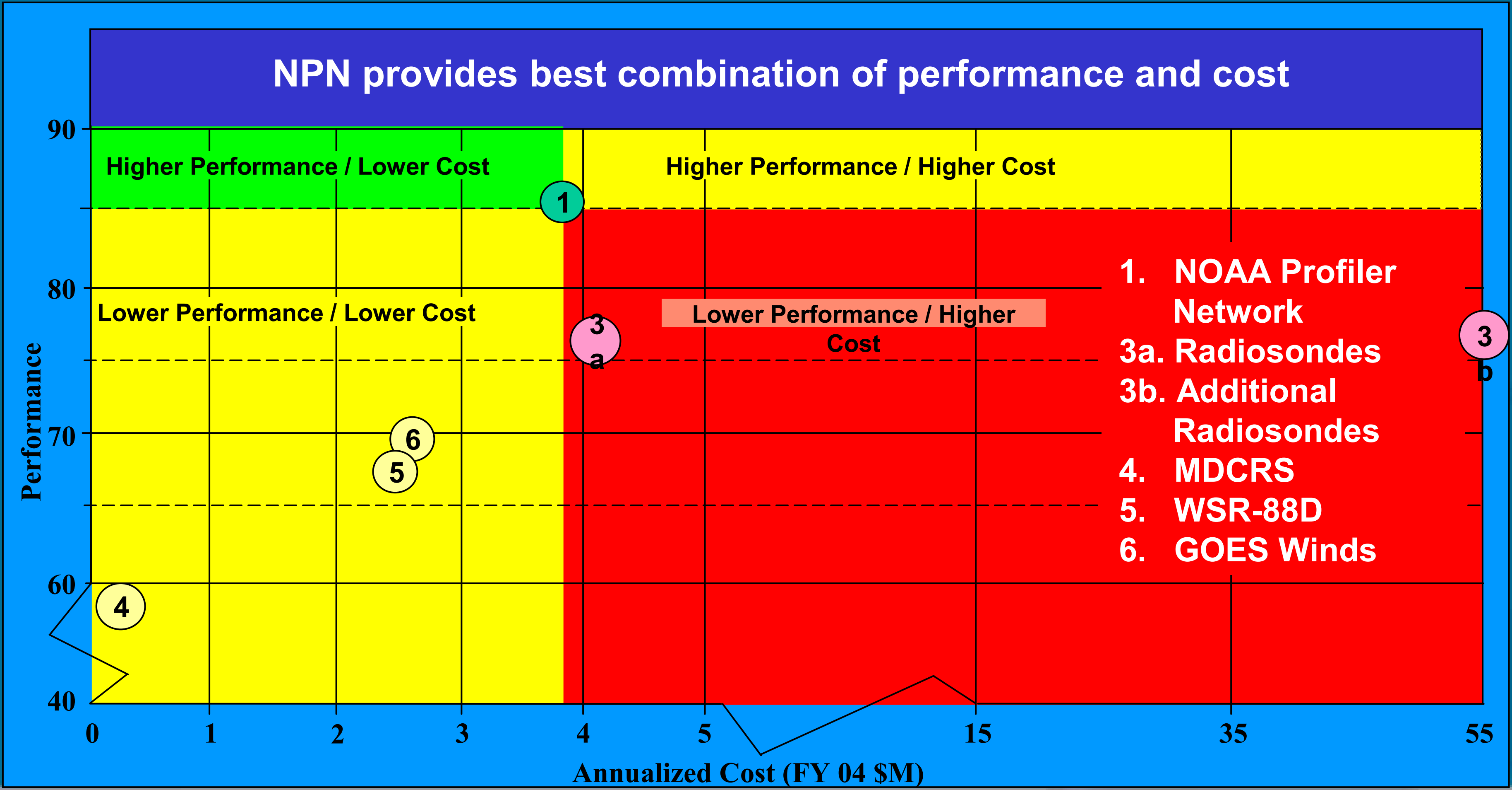


Profiler data improve 3 hour prediction by
***more than 10 m/s* during changing weather**

Cost and Operational Effectiveness Analysis

Results

NPN *superior* to other wind detection systems in meeting NWS mission goals for short-range forecasting, watches, and warnings



NPN Integration with NWS

Near-Term Challenges

Develop New Relationships:

– Address new relationships through updated MOAs

– Clearly defines roles and responsibilities

– Define relationship of NPN staff within Office of Operational Systems (OPS) and Weather and Water (MG3), Local Forecast and Warnings (LFW)

– Coordinate staffing and personnel issues, e.g. pay-banding

RASS Sensor

Moisture Sensor

CAP Low Altitude Winds

NPN Hub Quality Control

NPN Integration with NWS

Long-Term Challenges

Defining the Demonstration Division (DD) within NOAA:

- What is the role of the DD within OPS/LFW?
    - As a Center, e.g., ROC and NDBC
    - As a component of the Field Systems Ops Center
- What role will DD play in modernizing NOAA's observing systems within OST/STI?
    - How will GPS IPW become a backbone component of NOAA's IOS
- What role will DD and FSL have in data management (e.g. MADIS and NPN Hub) and observing system testing and implementation within NOSA?

DD must be aggressive in defining its role or be defined by others…

Integrated Upper Air Observing System

"*Integrated*" Defined

Goal of Integrated Obs: Integrated observing system strategy transitions NOAA from a series of unrelated "stove-pipe" observing and data management capacities to a seamless "system-of-systems"

What is an "integrated" observing system?

- Plans – Drawn from integrated requirements (e.g. NOAA Observing System Architecture) and documented "gaps" (e.g. PBA/PPBES)
- Programs – Integral to a larger observing system strategy (e.g. IROS, GEO, IGOS)
- O&M – Part of NOAA's core monitoring, engineering, testing, processing, and distribution capacities
- Outcomes – Addresses greatest cross section of Mission Goal requirements (Climate, Eco-systems, Water and Water, Commerce and Transportation). *Outcomes must be defines in terms of societal benefits!*

Integrated Upper Air Observing System

A Component of NOAA's Integrated Global Observing System

Goal of IUAOS: **Improve short term warnings and forecasts by observing pre-cursor conditions which are related to high-impact weather events**

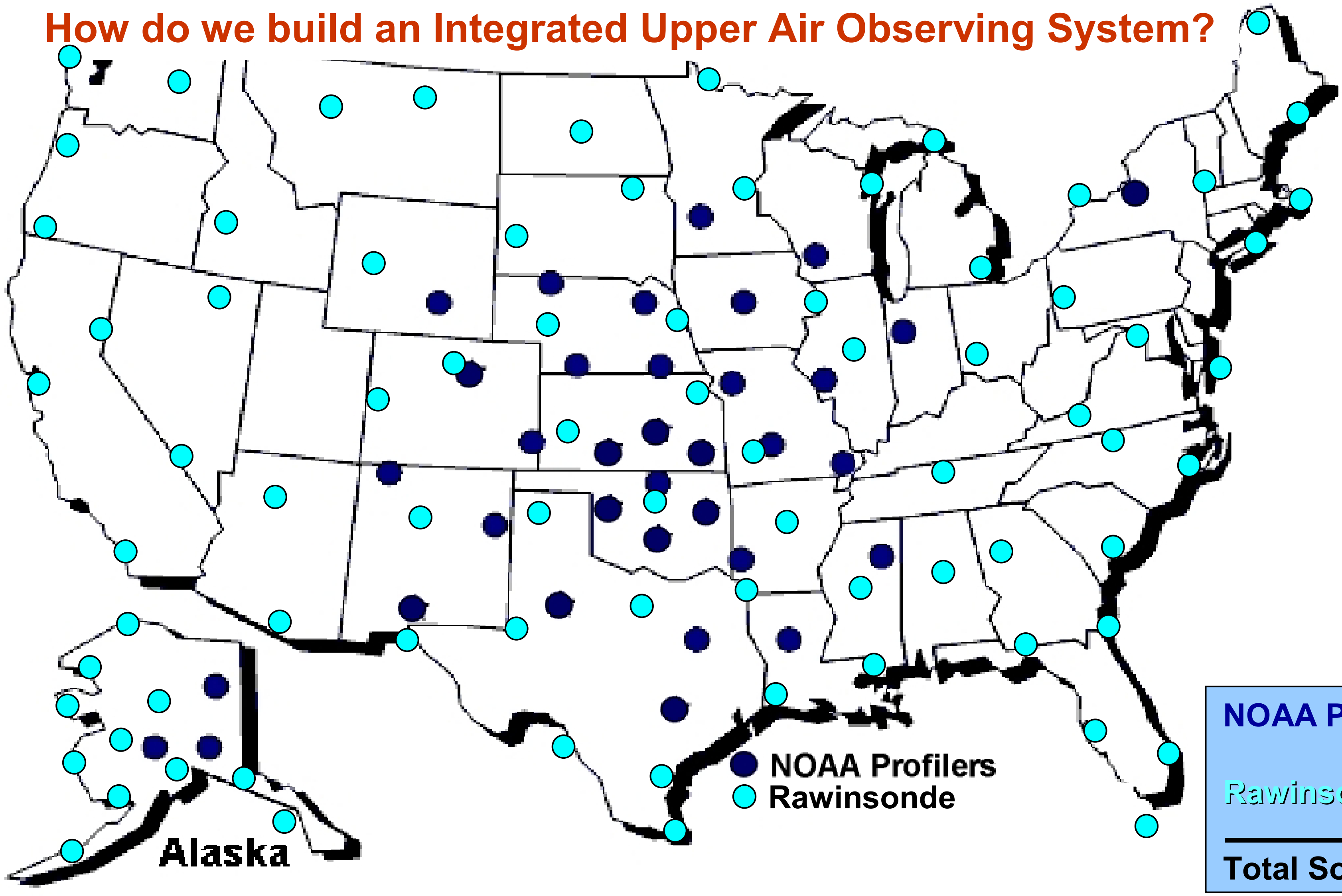
Key Objectives:

- Leveraging/Mix – 50% NOAA backbone, rest private and non-NOAA government
- Temporal – 1 sounding every 3 hours
- Parameters – *Winds*, Temperatures, Humidity, Precipitation, Cloud Properties, Air Quality, Turbulence
- Horizontal Resolution – 160 km or less
- Horizontal Domain – US CONUS, Alaska, Hawaii, Guam, Puerto Rico and coastal waters
- Vertical Resolution – 300 m or less
- Vertical Domain – Mix: Surface to 6 km minimally, but need to resolve tropopause transitions in vicinity of subtropical and polar jet streams as well, (16 km).

National Network

Current NOAA Profilers

How do we build an Integrated Upper Air Observing System?



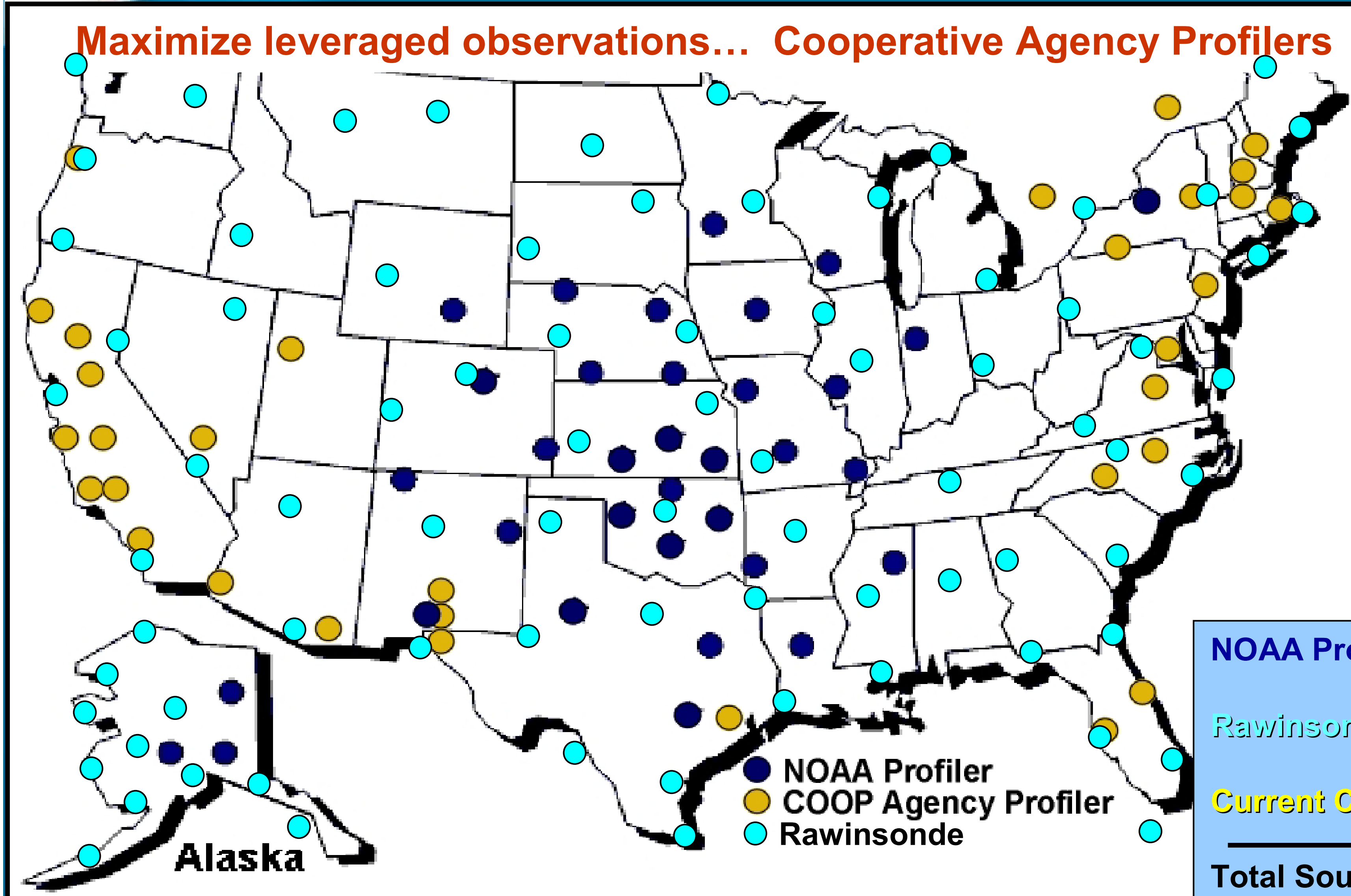
NOAA Profilers....... 35

Rawinsonde.......... 102

Total Soundings...... 137

National Network

Current NOAA Profilers and CAPs

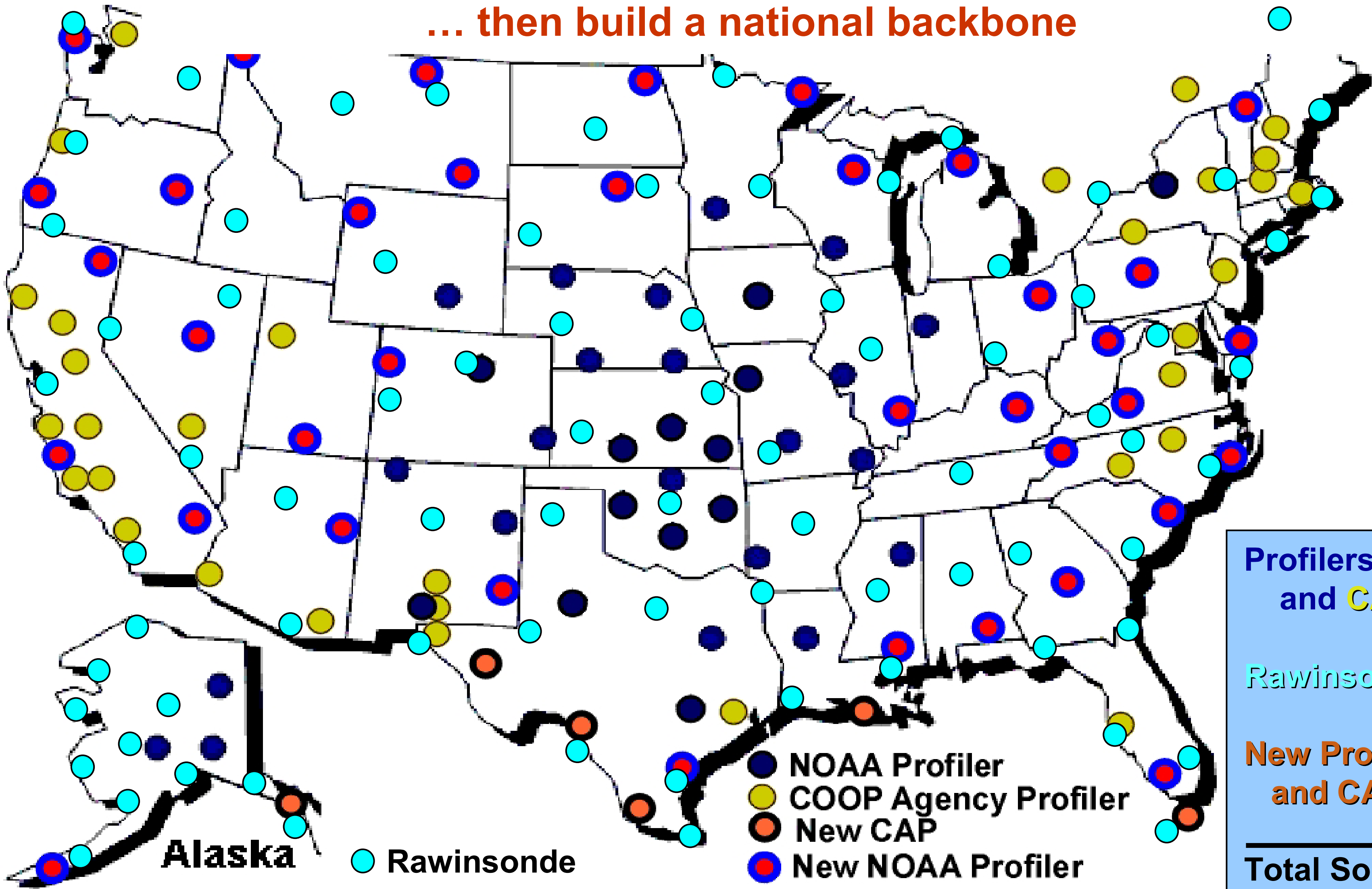


NOAA Profilers…….	35
Rawinsonde……….	102
Current CAPs………	80
Total Soundings……	217

National Network

An Integrated Upper Air Observing System

… then build a national backbone



Profilers and CAPs............ 115

Rawinsonde............102

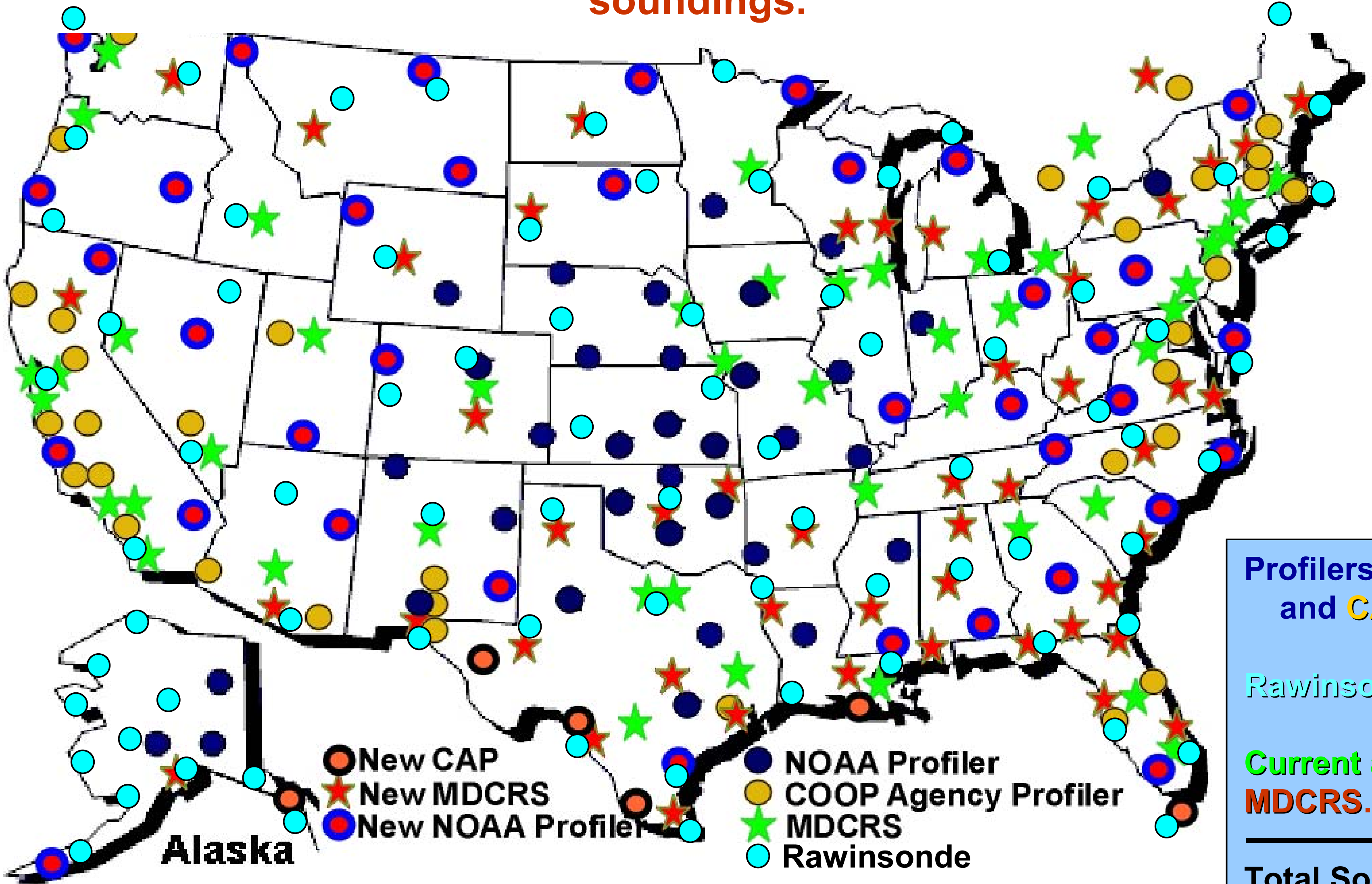
New Profilers and CAPs............. 60

Total Soundings...... 277

National Network

An Integrated Upper Air Observing System

… finally, extend the backbone's impact with using aircraft soundings.



Profilers
and CAPs………... 185

Rawinsonde…………102

Current and future
MDCRS……………….100

Total Soundings…… 387

Assessment

Based upon demonstrated benefits and COEA findings:

- **Assessment shows fund NPN beyond FY04; change frequency**
  - ***O&M: $3.5M/yr***
  - ***Frequency Change: $13.2M by end of FY08***
- **Develop plan for Integrated Upper-air Observing System with NPN as component**

Funding Strategy

Find savings (deferrals and/or reprogramming) in existing programs to fund FY 05 & 06 NPN O&M and portion of frequency change costs.

Program NPN O&M and frequency change completion costs in FY 07-11 PPBES as part of an out year Integrated Upper-air Observing System

Roadmap

Are we out of the woods yet?

- Deliver COEA to Congress before the 2 Aug 04 suspense date. (Submit to NOAA: June 04)
- Work FY05&06 funding (Oct. 04)
- Include NPN O&M and frequency upgrade in FY 07-11 Program Plan (OST/MG3, Fall 04)
- Develop national plan for integrated upper air observing system, including radiosondes, aircraft, profilers, satellites--all within NOAA enterprise architecture (OST/MG3, ready for FY 07-11 Program Plan)

NOAA PROFILER NETWORK TECHNICAL REVIEW

Concluding Remarks

Q & A

Presented by

Margot H. Ackley

June 22, 2004

Transition to NWS

- **From its inception, the NPN's programmatic and technical decisions were influenced by the goal of minimizing future efforts to transition the system to NWS.**

- **The NPN has a dedicated and highly skilled scientific and technical staff experienced in all aspects of Profiler Networks. Some have been with the program for over 15 years and have been instrumental in moving Profiler Technology from the field of research into an operational technology now used world wide.**

Transition to NWS

- A solid infrastructure and refined procedures allow day-to-day operations of the NPN to mirror an "Operational" system rather than a "research field" system.
- A large customer base regularly depends upon the NPN for high quality, reliable data.
- A fully operational and expanded NPN will provide the Nation with enhanced public safety, property protection, and will support the Nation's Homeland Security program.

Key Meeting – August 19, 2003
Silver Spring, MD

Attendees:

NWS/OST: Jack Hayes, Frank Kelly, Steve Gallagher, David Green and David Helms

FSL/NPN: Tom Schlatter, Margot Ackley and Seth Gutman

Action Items

- Begin concentrated effort to produce the COEA as requested by Congress
- Establish: Operations and Maintenance Transition Team for the migration of NPN from OAR to NWS
- Establish: Atmospheric Observing System Transition Team to identify gaps, solutions and alternatives for meeting NOAA performance measures through 2020

Bridge Talk

On Building Bridges
Or
Alternative Methods for Achieving Technology Transfer in NOAA

By

C. Gordon Little

D. B. Miner

- 1985 -

ON BUILDING BRIDGES

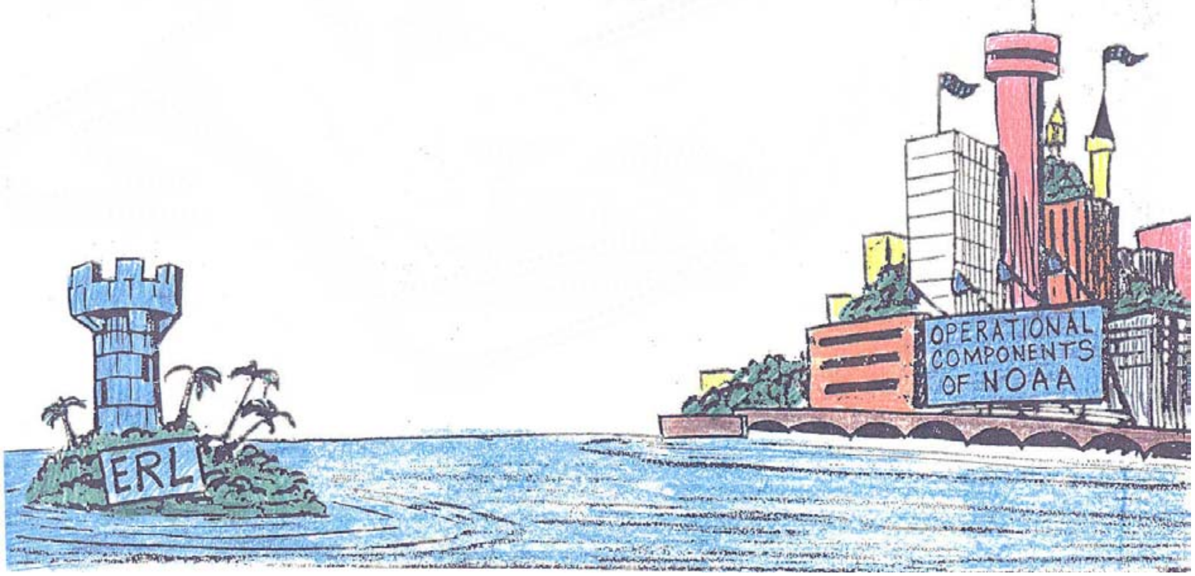
OR

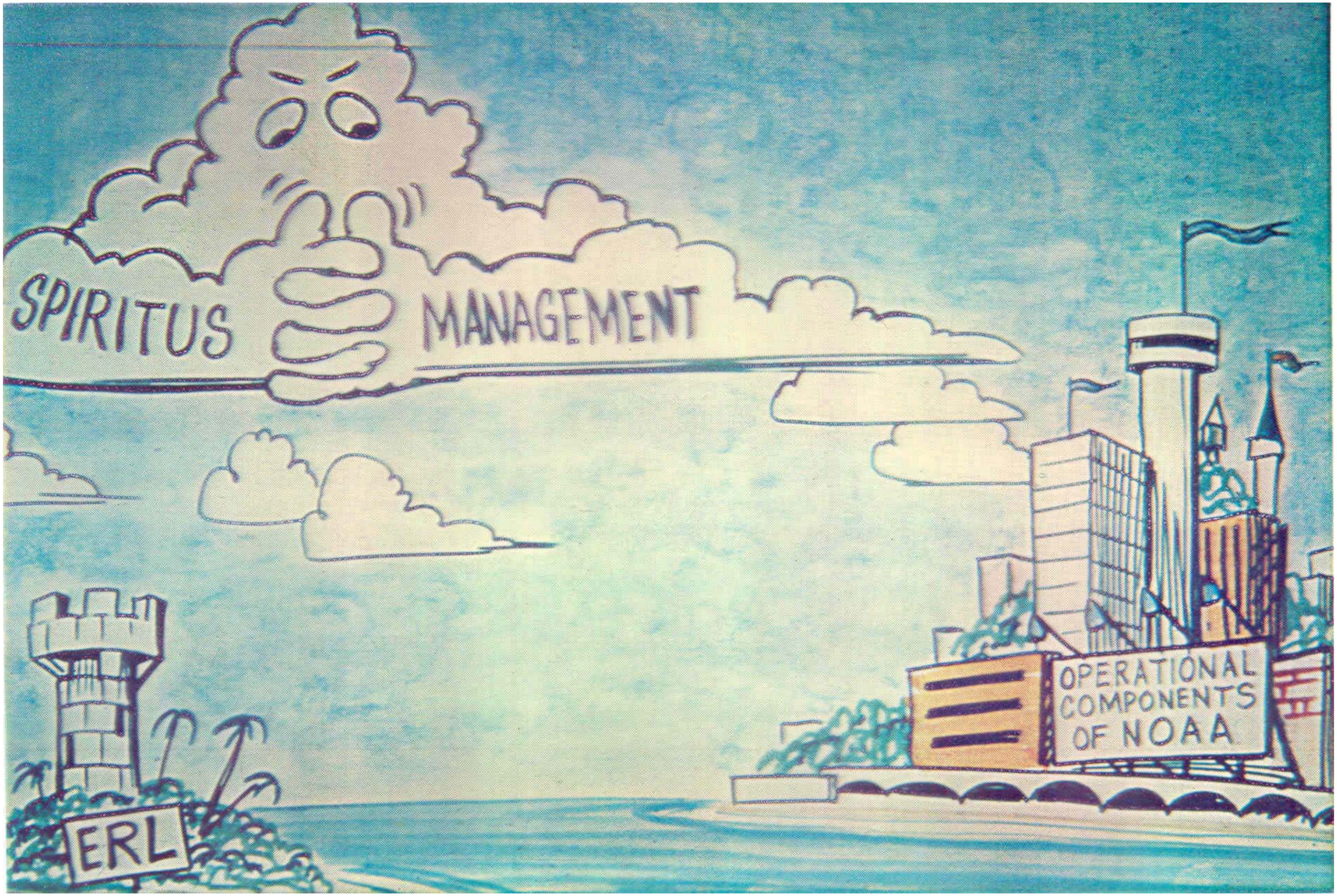
ALTERNATIVE METHODS FOR ACHIEVING
TECHNOLOGY TRANSFER IN NOAA

by

C. Gordon Little

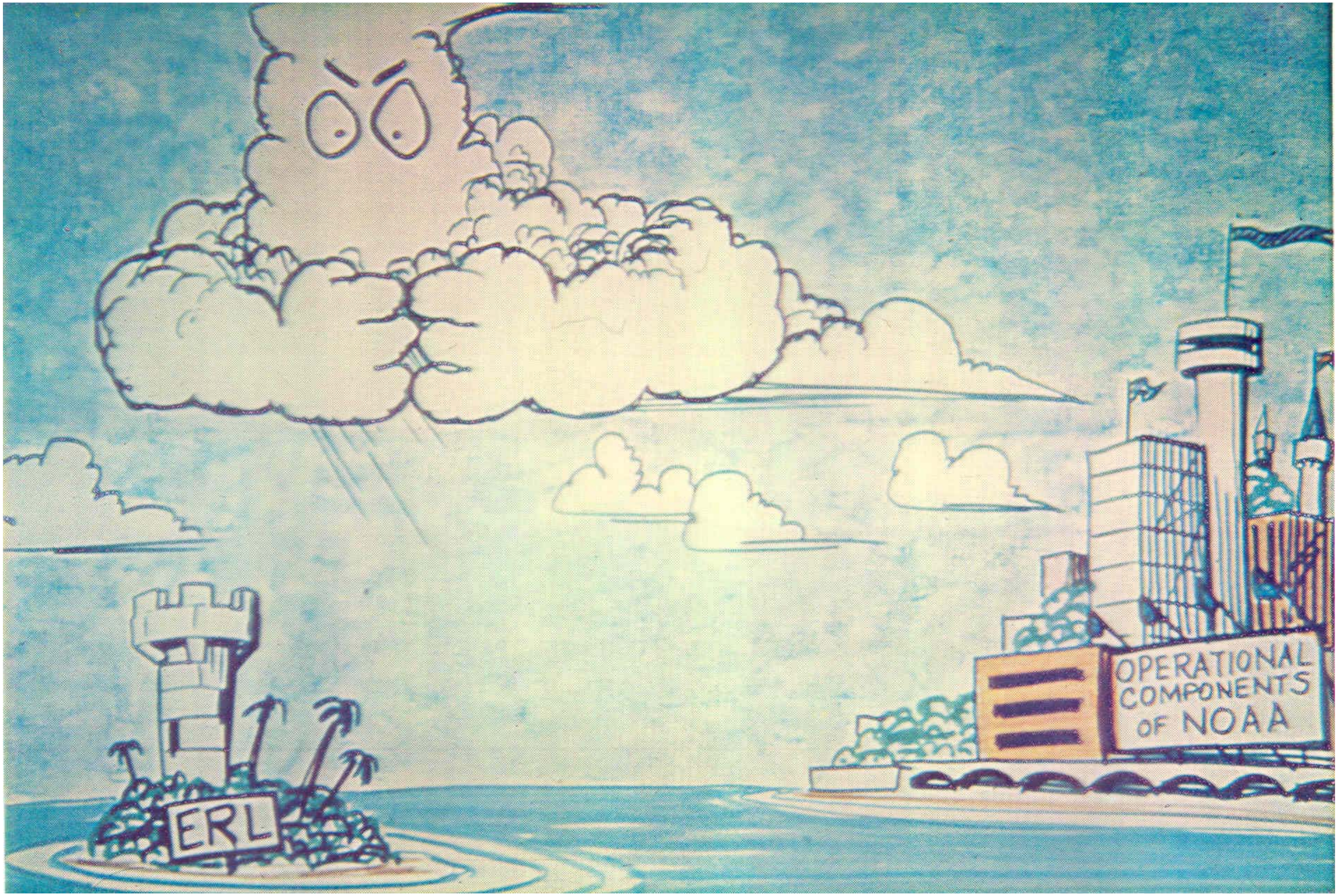
D. B. Miner





The Problem – How should we in NOAA build our Technology Transfer bridges?

Method 1 – The Policy Statement

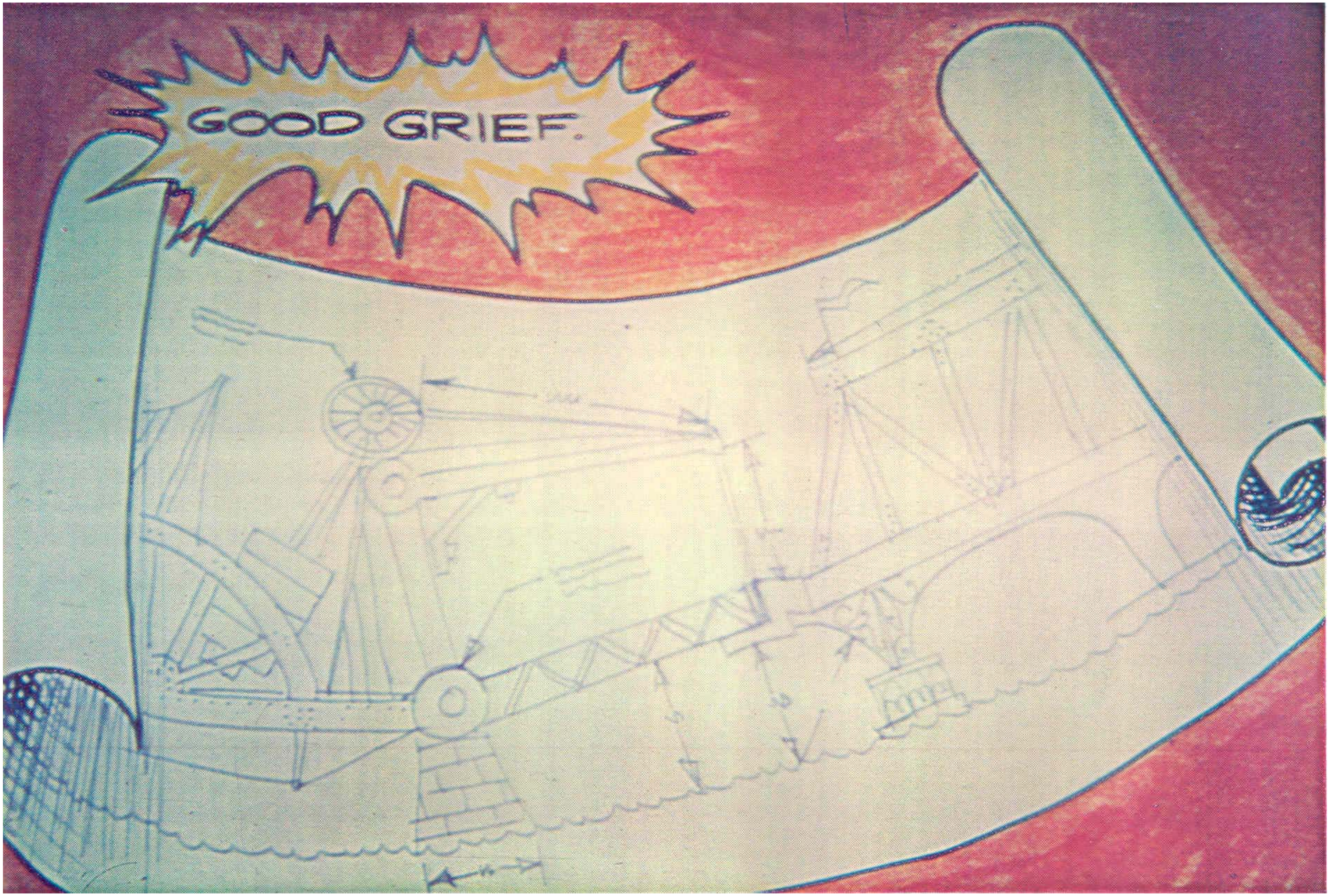


- And its Response

Method 2 - The Mandate

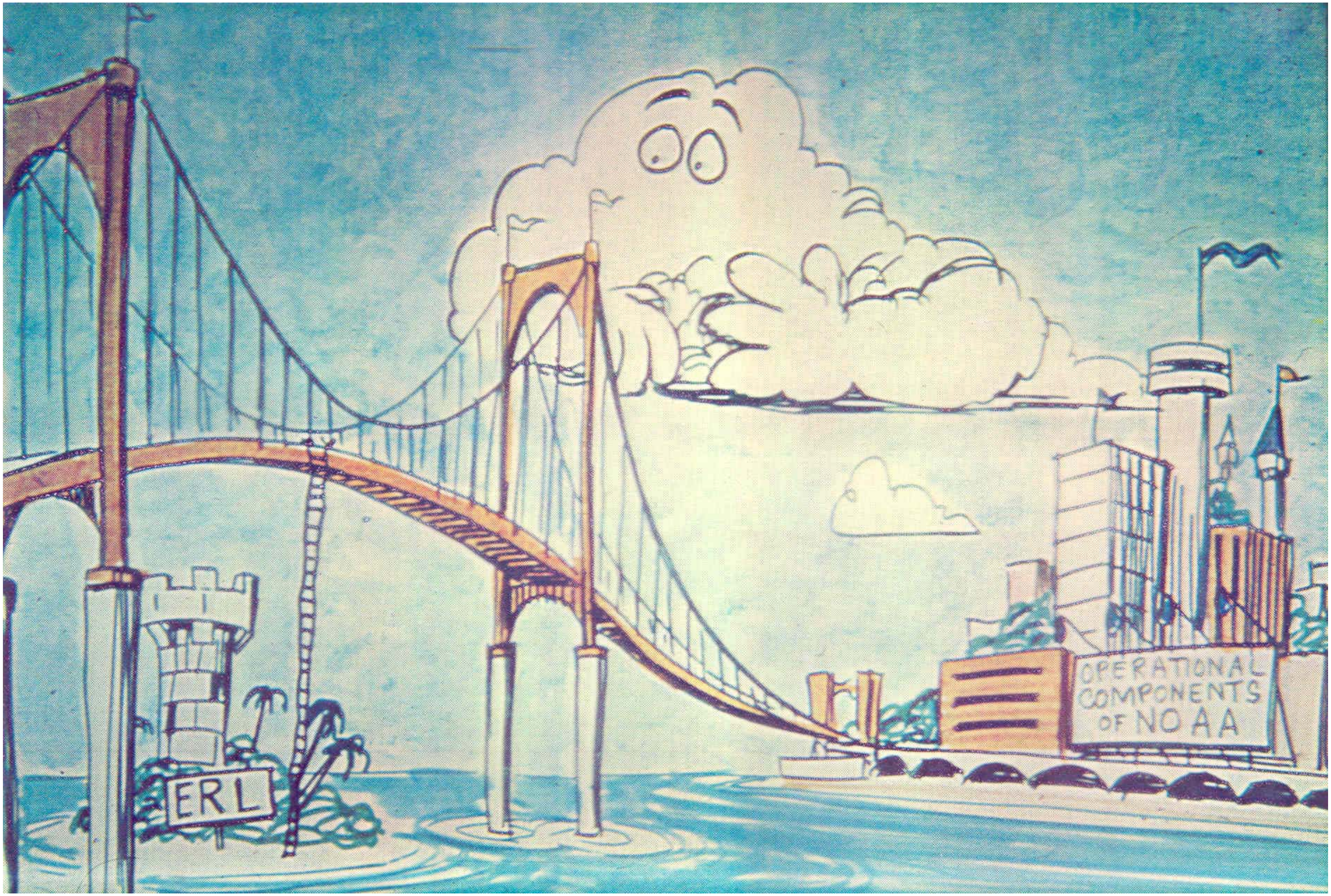
- And its Products

Method 3 – The Committee Approach

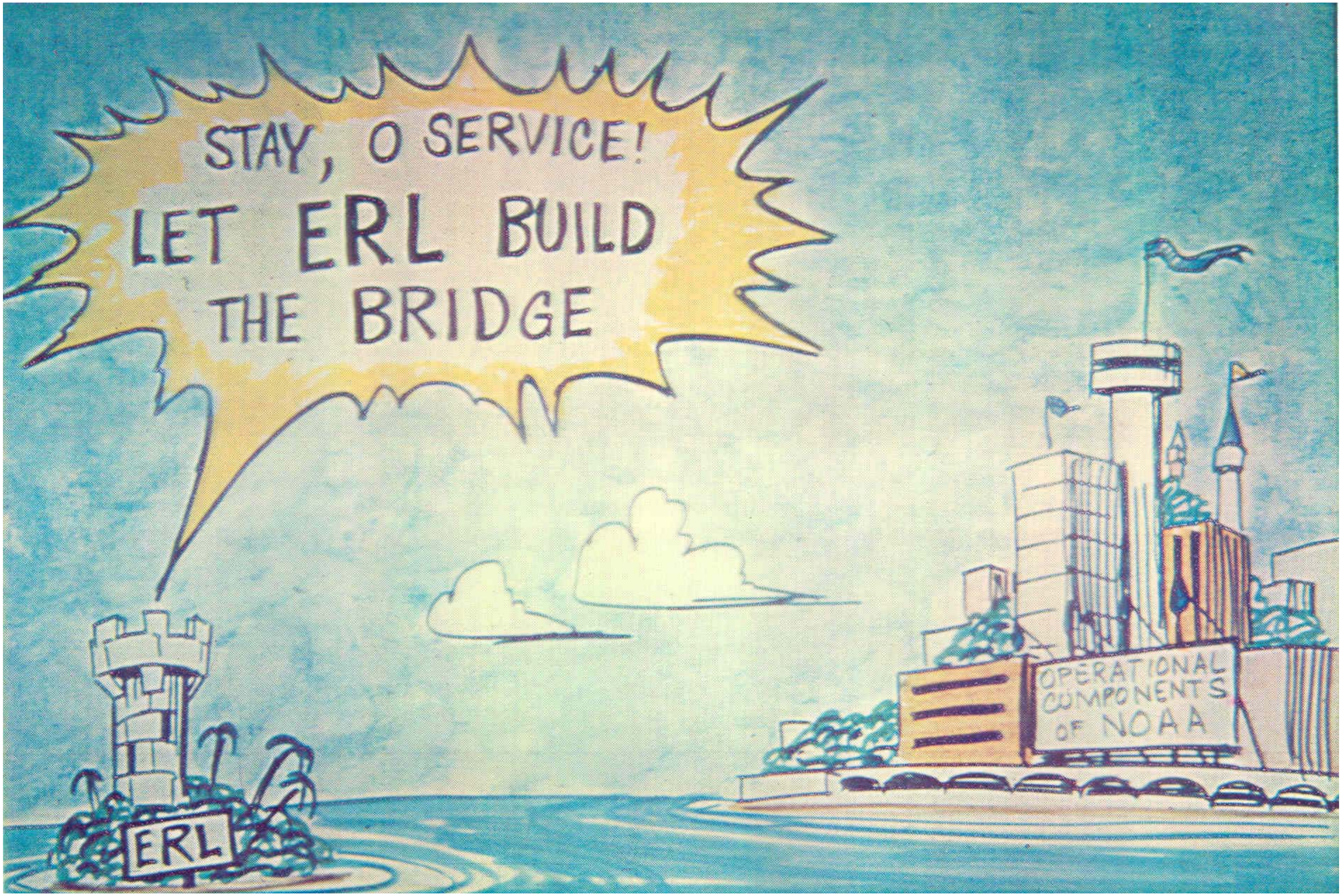


- And their Magnum Opus

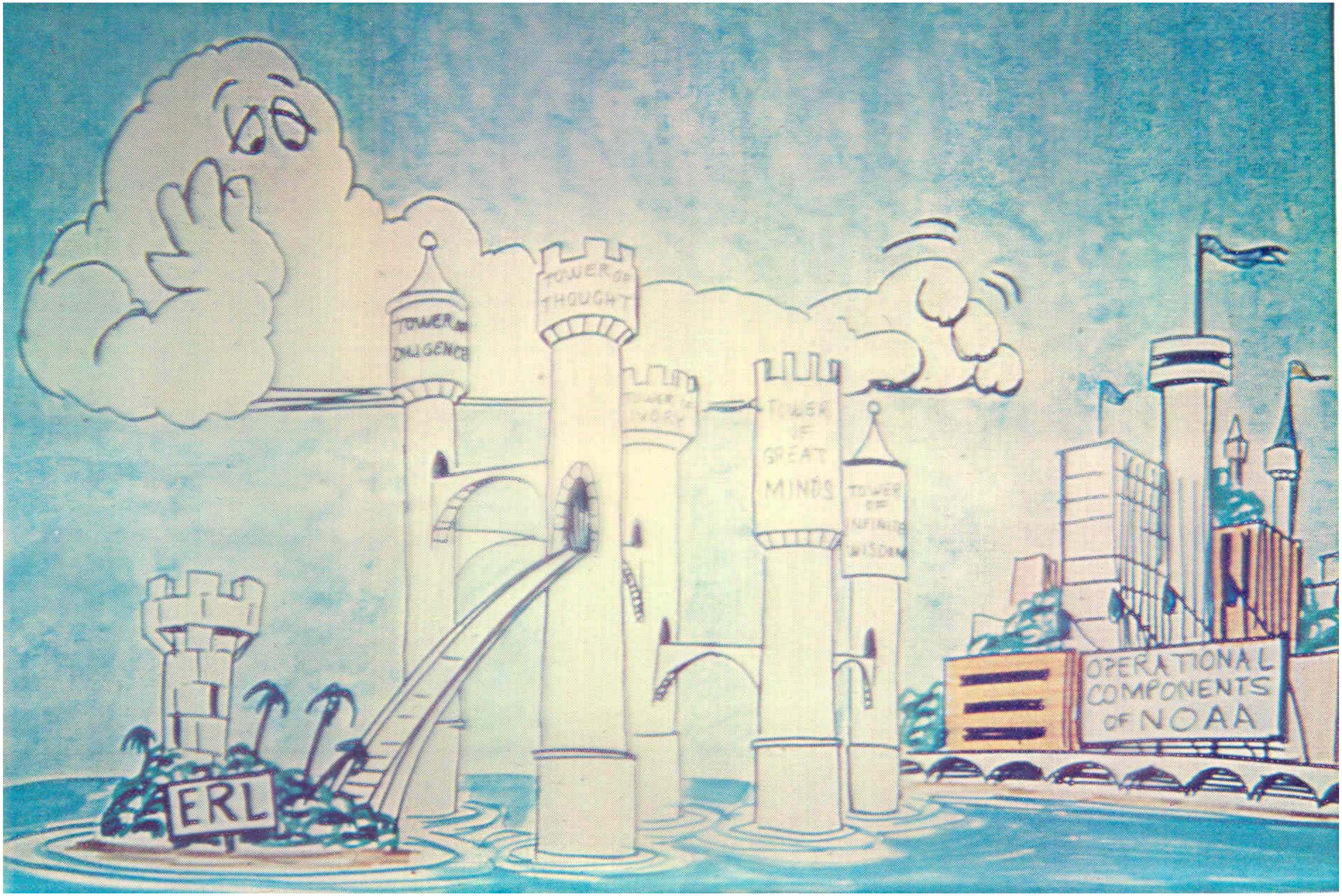
Method 4 – Assign the task to the Weather Service



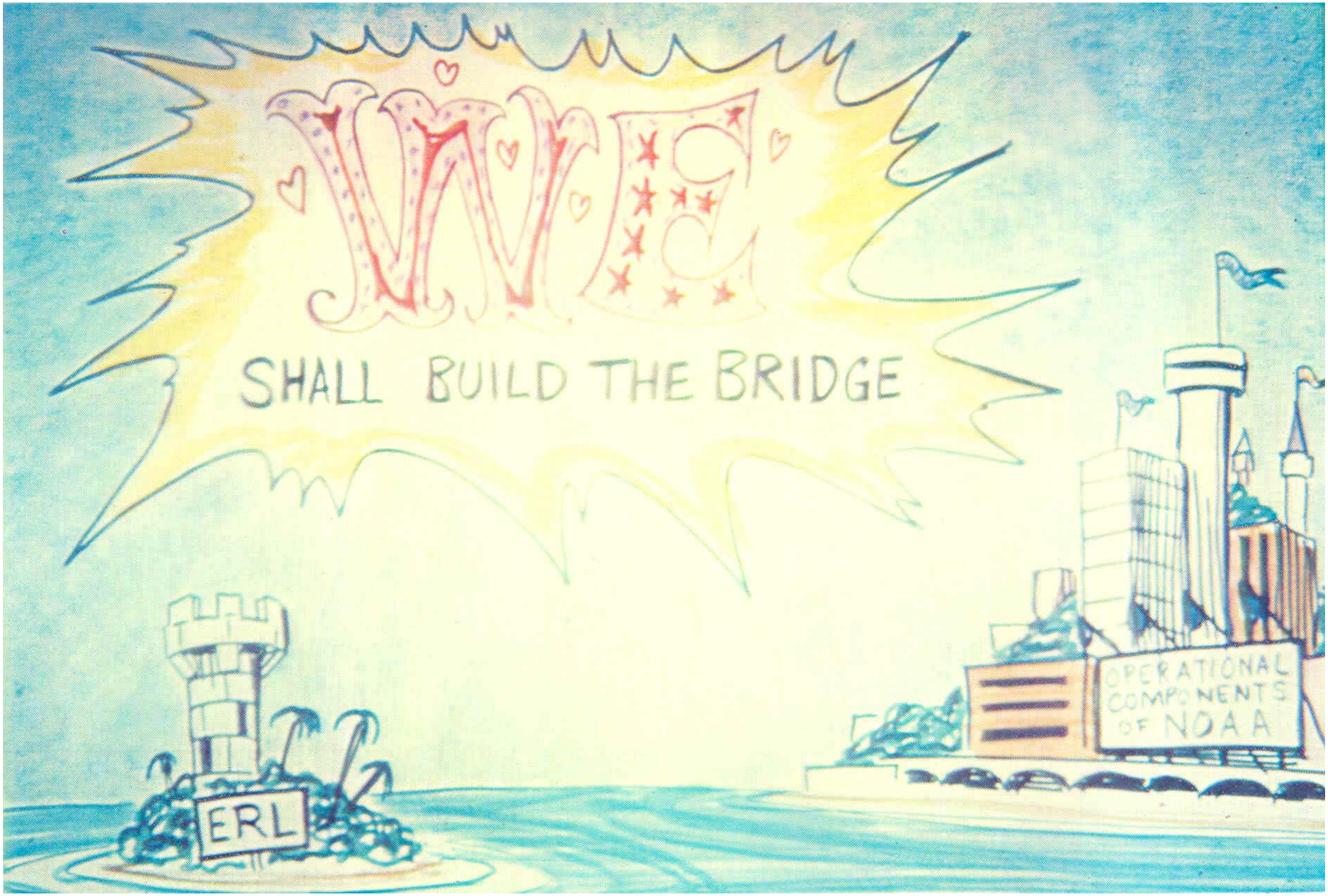
- And their Creation!



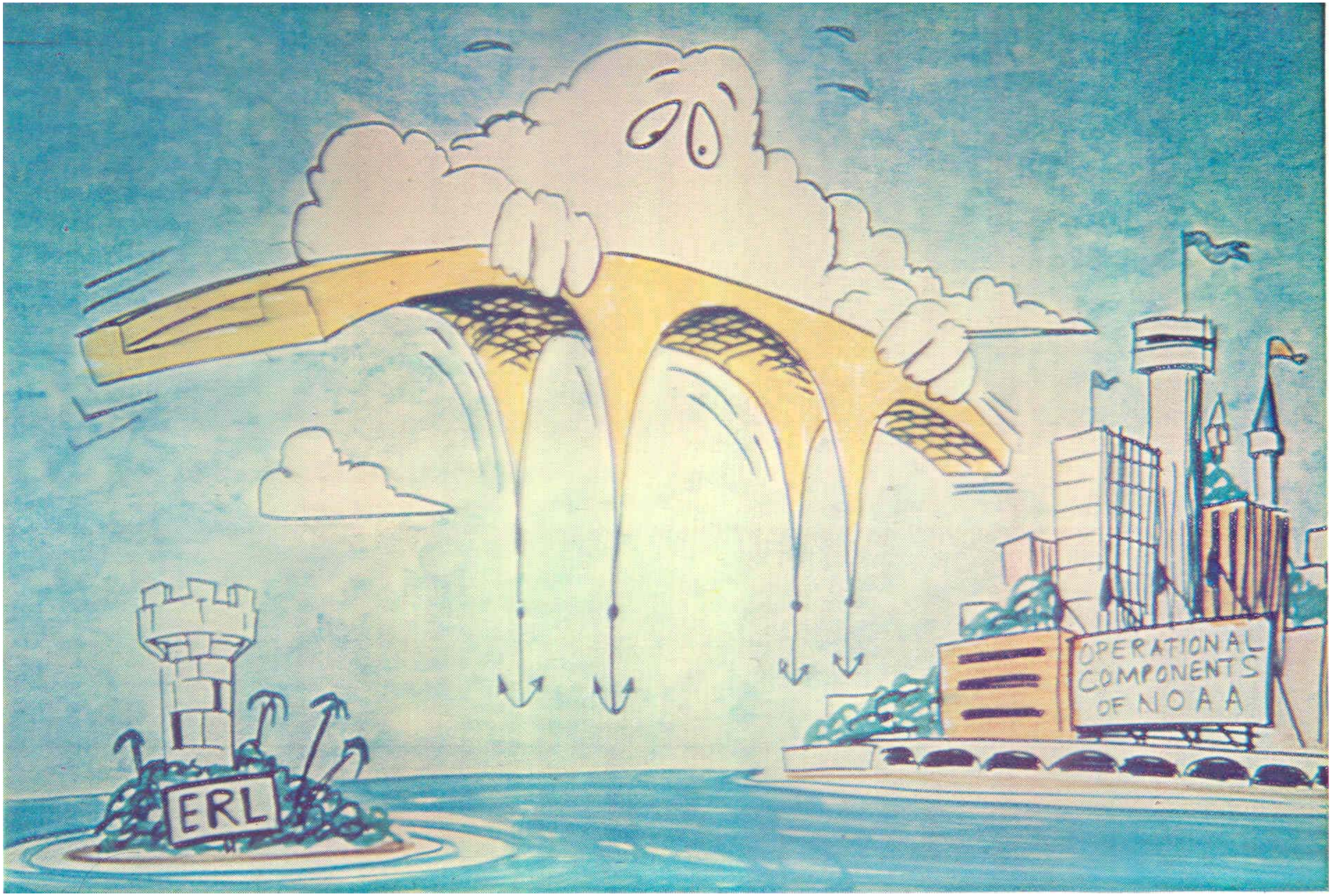
Method 5 – Assign the task to ERL



- And their Masterpiece!

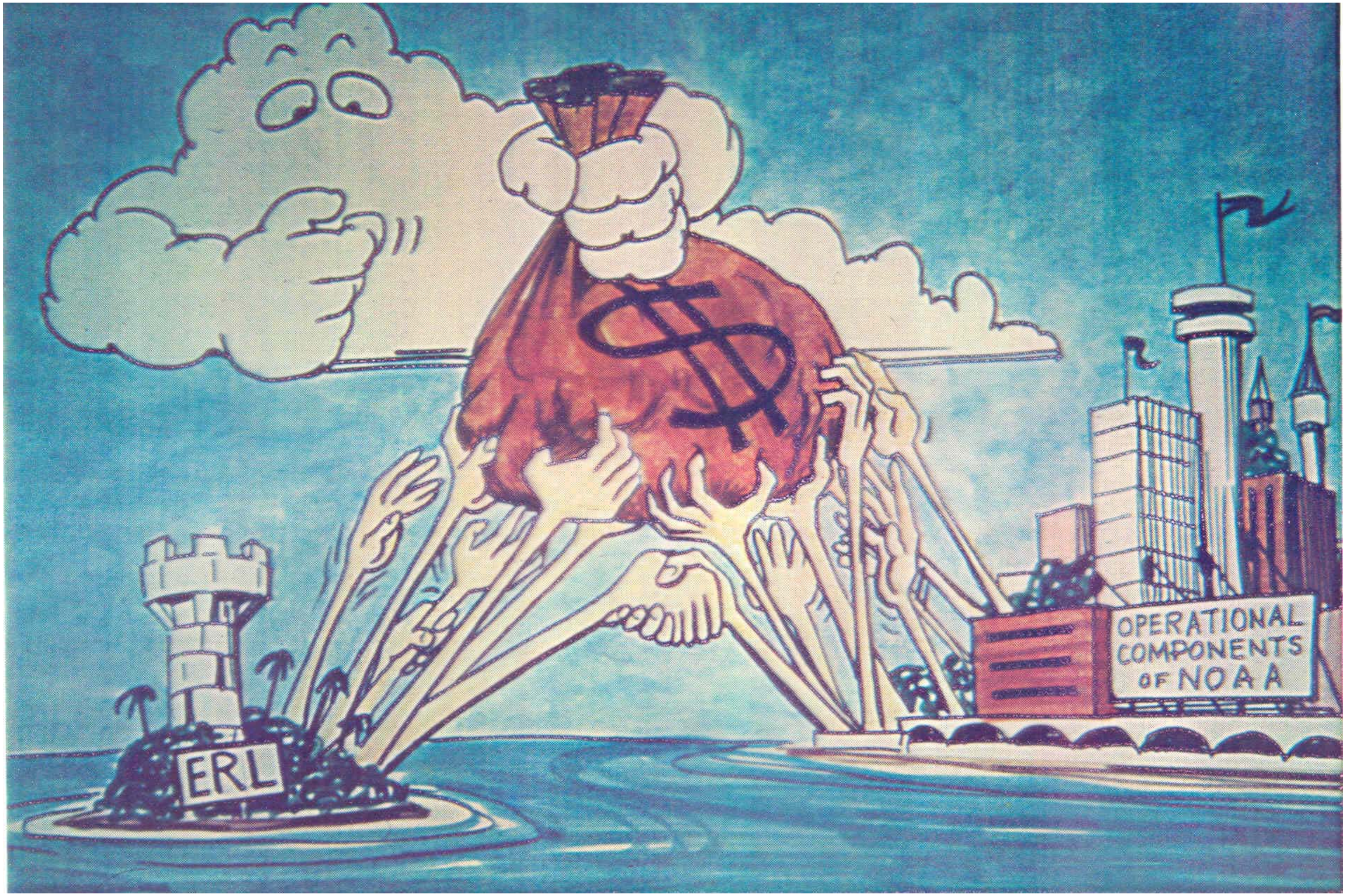


Method 6 – Building from High



- And its Problems

Finally, a Solution is Found



Method 7 – The Solution – Resources for All

- And after things have settled down…

In Closing

~The NOAA Profiler Network~

- Has over 12 years of proven operations
- Is a trusted source of high quality and reliable data
- Will continue providing the Nation with enhanced public safety and property protection

"Keep the Lights GREEN"

"We are here to SERVE"